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Review article

Should we advise women that pre-labor caesarean section prevents pelvic floor dysfunction?

Bertrand Gachon[a,b,c,*], Renaud De Tayrac[d], Thomas Schmitz[e,f], Tahir Mahmood[g,h], Jacky Nizard[i], Xavier Fritel[a,c,j]

[a] Department of Obstetrics and Gynaecology, La Milétrie University Hospital, Poitiers France
[b] Nantes University, Movement – Interactions – Performance, MIP, EA 4334, F-44000 Nantes, France
[c] INSERM CIC-P 1402, La Milétrie University Hospital, Poitiers, France
[d] Department of Obstetrics and Gynaecology, Carémeau University Hospital, 30900 Nîmes, France
[e] University Paris VII, Paris-Diderot, France
[f] Department of Obstetrics and Gynaecology, Robert Debre Hospital, Paris, France
[g] Consultant Obstetrician and Gynaecologist, NHS Fife, Scotland
[h] Immediate Past President, European Board and College of Obstetrics and Gynaecology (EBCOG) and Chair of the EBCOG Standards of Care and Position Statements Group, Belgium
[i] President European Board and College of Obstetrics and Gynaecology (EBCOG), Belgium
[j] INSERM, Centre for Research in Epidemiology and Population Health (CESP), U1018, Gender, Sexuality and Health Team, Univ Paris-Sud, UMRS 1018, France

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* Corresponding author at: Poitiers University Hospital, department of obstetrics and gynecology, 2 rue de la Milétrie CS90577 – 86021 Poitiers Cedex, France.
E-mail address: bertrand.gachon@chu-poitiers.fr (B. Gachon).

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Introduction

Vaginal delivery is reported as a main risk factor of pelvic floor dysfunction. Nevertheless, data with a high level of evidence are lacking to confirm the hypothetic protective effect of pre-labor caesarean section. In order to promote a preventive strategy for a disease, it is necessary to know perfectly its pathophysiology and to be sure that the strategy is in place before the beginning of the pathological process. In other words, the causality between the exposure factor and the disease must be certain. Due to the maternal and neonatal morbidities associated with caesarean section it is essential to be careful before promoting prophylactic pre-labor caesarean section policies [1,2]. The objective of this scientific review is to provide a systematic analysis of the causality between vaginal delivery and pelvic floor dysfunction using Hill's criterion for causality in order to devise a policy of advising pre-labor caesarean section to prevent pelvic floor dysfunction [3,4].

Strength of association

Two randomized trials analyzed pelvic floor function according to the mode of delivery [5,6]. In the Term breech trial, there were no differences for any pelvic floor disorders two years after the delivery (intention of vaginal delivery versus planned pre-labor caesarean section) [5]. For twin deliveries, the authors reported a protective effect of planned caesarean section versus the intention of vaginal delivery only for problematic urinary incontinence (OR = 0.63 [0.47–0.83]) [6]. The meta-analysis of Keag et al. reported a protective effect of caesarean section for urinary incontinence (OR = 0.56 [0.45–0.68]) and pelvic organ prolapse (OR = 0.29 [0.17–0.51]) but not for sexual function and faecal incontinence [7]. Two other meta-analyses reported vaginal delivery as a risk factor of stress urinary incontinence (OR = 1.85 [1.56–2.19]) and caesarean section as being protective from urinary incontinence (OR = 0.56 [0.45–0.68]) [8,9]. The Cochrane meta-analysis about anal and faecal incontinence did not find any significant association with the mode of delivery [10]. There is only one significant study reporting an increased risk in the case of vaginal delivery (n = 185,219 women) versus caesarean delivery (n = 1,400,935); (RR = 1.65 [1.49–1.82]) [11]. Nevertheless, this result is quite confusing since the prevalence of anal incontinence in this study is very low (less than 0.5%) compared to all other studies (2–20%) [5–7,10]. There are several data in the literature for an association between the mode of delivery, urinary incontinence and pelvic organ prolapse. We will investigate if this association fits Hill's other criterion for causality. Conversely, there is no evidence for an association between the mode of delivery and sexual dysfunction. We considered that the existence of only one significant study suggesting an association between the mode of delivery and anal incontinence, with the suggested limitations, is insufficient to conclude as evidence in the literature for this association. This considered, causality will not be investigated for anal incontinence and sexual dysfunction.

Consistency of the observed association

This criterion of causality is fit when there are multiple epidemiologic studies with various populations and methods which report the considered association [3,4]. In terms of pelvic organ prolapse, there is an important consistent association reported in favor of a protective effect of cesarean section. The results are still being debated about the association between the mode of delivery and urinary incontinence. In the Term breech trial, a protective effect of pre-labor caesarean section from stress urinary incontinence was reported at 3 months postpartum but disappeared 2 years after the delivery (OR = 0.81 [0.63–1.06]) [5,12]. Several prospective and retrospective studies reported no association between postnatal incontinence and the mode of delivery [13–16]. Finally, it seems that the consistency criterion is obviously fit for the association between pelvic organ prolapse and the mode of delivery since data are more uncertain about urinary incontinence.

Specificity

To fit this specificity, Hill's causality criterion was that exposure should cause only one disease [3,4]. The supposed association between the mode of delivery and pelvic floor disorders seems to fit this item. Indeed, we have data reporting that the mode of delivery is not associated with other conditions that may be involved with pelvic floor dysfunction [7]. One exception is the fact that having a caesarean section for the first delivery is an important risk factor in having fewer subsequent pregnancies [7,17]. So, women who deliver by caesarean section are less exposed to the obstetrical risk of pelvic floor disorders. We consider that the fitting of this criterion is uncertain, since being exposed to vaginal delivery does not expose women specifically only to pelvic floor dysfunction. Having a baby born vaginally is, indeed, a major factor associated with several future expositions to both pregnancy and the delivery and so the specific relation between the delivery and pelvic floor dysfunction cannot be affirmed. Nevertheless, this criterion is considered as weak and irrelevant due to the evident difficulties to confirm that one exposure induces only one disease [3,4].

Temporality

In most studies, there are no data about pelvic floor function before the exposure factor (mode of delivery) [7,18–22]. Having considered this, it is not possible to know if the symptom appears before or after the exposure to the mode of delivery. A personal history of pelvic floor dysfunction is reported as a main risk factor of postnatal pelvic floor dysfunction [10,23,24]. These antenatal disorders are frequent, especially during pregnancy [23,25]. Different studies report lower bladder neck mobility and a lower levator hiatus biometry for pregnant women who will deliver by caesarean section [26–28]. On the other hand, there are data reporting no difference of pelvic organ prolapse prevalence during pregnancy whereas it is increased following a vaginal delivery [24]. Due to this discordance we cannot consider that the temporality criterion is fit for the association between the mode of delivery and pelvic floor dysfunction. This criterion is universally considered as Hill's hypothesis for causality, necessary to conclude a causality [3,4].

Biological gradient

This criterion is applicable when the exposure is more intense and frequent and the disease is more frequent and severe [3,4]. When considering data reporting that the risk of pelvic floor dysfunction is increased in the case of operative vaginal delivery compared with spontaneous delivery, one interpretation may be that the more intense the perineal solicitation is during childbirth, the more important is the risk of pelvic floor dysfunction [22,29]. It is reported that the risk of pelvic floor dysfunction increases with the number of vaginal deliveries [20–22]. When interpreting this point in regard to the temporal criterion, it remains uncertain that this criterion is fit since these women have been exposed several times to vaginal delivery but also several times to pregnancy and, as we said previously, pelvic floor function between and during the different pregnancies is not known. Data are conflicting about the association between the mode of delivery and pelvic floor

dysfunction when considering specifically severe dysfunction, even if most of the studies report a protective effect of caesarean section [13,20,30]. Finally, it is difficult to reach a conclusion about this biological gradient criterion.

Plausibility and biological coherence

This criterion is fit when there is coherence between epidemiological and clinical data; that is to say when a symptom is associated with a pathophysiological substrate [3,4]. Data show an important stretch of the pudendal nerve during a vaginal delivery with some studies reporting more frequent pudendal neuropathy after vaginal delivery compared to caesarean section [31]. Nevertheless, this association is not consistent with the literature with no means of confirming the biological coherence between vaginal delivery and pelvic floor dysfunction with this substrate [32]. There are data reporting increased pelvic organ mobility after a vaginal delivery compared with a caesarean section: increased bladder neck descent, levator avulsion and increased levator hiatus area, and these factors are associated with pelvic floor dysfunction [33,34]. It appears logical to suggest that vaginal delivery induces the anatomical defect leading to the pelvic floor dysfunction. Nevertheless, some published evidence report that such an increase in pelvic organ mobility is also reported during pregnancy and recovery during the year following delivery for most of cases and with no differences at 12 months, for most of the measures, between women who deliver by caesarean section and those who deliver vaginally [33,34]. Data to support this plausibility criterion for causality between the mode of delivery and pelvic floor dysfunction seems weak.

Experiment

There are animal experiments and computer simulations suggesting that a vaginal delivery is probably associated with an important stretch of the pudendal nerve beyond the threshold known to cause permanent damage [35,36]. There are also several recent data reported from computer simulations of childbirth and especially the impact of vaginal delivery on the pelvic floor muscles. These works indicate that there is effectively a major stretch of pelvic floor muscles during childbirth but also that these muscles have the capacity to accommodate in most cases [37,38]. This power of accommodation of the pelvic floor muscles is probably related to some changes into biomechanical characteristics of the pelvic floor muscles during pregnancy, which is supported by several animal experiments [39]. Finally, there is a randomized trial about pelvic floor function that compares vaginal delivery and pre-labor caesarean delivery in squirrel monkeys. This study reports that there is an alteration of the coccygeus muscle in the case of vaginal delivery without causing any effect on the levator ani muscle and the bladder neck position assessments, whose main factors are associated with pelvic floor dysfunction. The authors conclude that the preventive effect of pre-labor caesarean section is not consistent on pelvic floor dysfunction which is induced by the pregnancy and delivery [40]. Data analysis for the assessment of the experiment criterion is consistent with those about the plausibility criterion. Data demonstrate an important stretch of the pelvic floor during childbirth but without data suggesting that this is associated with pelvic floor dysfunction and even with experimental data reporting that women's pelvic floor accommodates to this distension in most of cases. Finally, we cannot consider that this criterion is fit.

Analogy

According to Hill's criterion for causality this criterion suggests that when there is a strong association between an exposure and a disease, we may accept that a similar exposure can cause a similar disease [3,4]. In our opinion this criterion is very difficult to apply to the association between the mode of delivery and pelvic floor dysfunction. The mode of delivery, for a very complex outcome which involves biomechanical characteristics of pelvic floor, muscular and nerve stretch, a fetal head that can be from different size and positions are compounding factors. Furthermore, pelvic floor dysfunction is also a much more complex disease involving muscular, neurological, conjunctival and pathophysiological substrates. This complexity is probably one major explanation for the absence of randomized trials addressing pelvic floor dysfunction according to the mode of delivery. Finally, this criterion does not seem appropriate to the topic of this paper.

Conclusion

It can be concluded that using Hill's criterion for causality, the proof of causality is not established when considering this objective analysis between the mode of delivery, and the potential protective effect of pre-labor caesarean section on pelvic floor dysfunction. There is, undeniably, evidence for an association between the mode of delivery and urinary incontinence or pelvic organ prolapse. Nevertheless, when carrying out an in-depth analysis, such an association has a number of limits and the main one is the temporality criterion. To be validated as a protective measure for the primary prevention of pelvic floor dysfunction, pre-labor caesarean section should take place before the apparition of any pelvic floor dysfunction and, regarding the data reported in this paper, we cannot confirm that. Furthermore, the pathophysiology must be perfectly known and even if there is consistent data for the pelvic organ prolapse, data are much too contradictory to assure that this is the case for urinary incontinence. Finally, it is necessary to be very careful before affirmation of a protective effect and to advise pre-labor caesarean section to protect from pelvic floor dysfunction.

EBCOG therefore recommends that obstetricians should have an evidence-based approach for counseling women as regards the various modes of delivery and their effects on pelvic floor dysfunction in future. Both organisations urge upon clinical scientists to organise large scale prospective studies to address gaps in our knowledge as identified in this scientific review.

Review and approval

This paper was reviewed by Professor Fionnuala McAuliffe, Dublin. It was approved by the Council of the European Board and College of Obstetrics and Gynaecology at its Council meeting, held in Warsaw in June 2019.

The final draft has been edited by Mrs Charlotte Mercer, Chief Administrator of EBCOG.

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