Pelvic Venous Congestion

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Abstract

Pelvic congestion is a diagnosis now infrequently made by gynecologists as a cause of chronic pelvic pain. Recent literature has been almost exclusively from radiological practice and does not always relate the diagnosis to pain. In this context the concept of pelvic congestion is reviewed from an historical perspective, clinical correlates identified, the pathophysiology discussed, and the place of this diagnosis in modern practice considered.

1 Pelvic Congestion: History of the Concept

Taylor proposed the concept of venous congestion as a cause of chronic pain in the mid-twentieth century (Taylor 1949). Congestion referred to dilatation and sluggish flow in the utero-ovarian veins, but this was not a commonly accepted concept in clinical diagnosis. Using a transcervical approach with injection of contrast medium into the myometrium, Beard and colleagues reported a comparison of radiological appearances of the pelvic veins in women with a range of clinical presentations (Beard et al. 1984). In the radiological literature, pelvic congestion was not exclusively linked to symptoms of pain, but a range of other conditions. In further work, a vasoconstrictor was used to provide evidence for a causal relationship between congestion and pain symptoms. Vasoconstriction in the pelvic veins was associated with symptom relief (Reginald et al. 1987).

Pelvic congestion syndrome is probably best considered in terms of a symptom complex primarily presenting in women in the reproductive age group, whereas endometriosis (at least its symptomatic presentation) is more common in nulliparous women, and childbearing does not appear to afford protection from pelvic congestion, probably the latter condition does not have a hormone-dependent inflammatory basis. However, parity is not a risk factor as has been thought in some literature studies. Typical complaints include a shifting location of pain, deep dyspareunia and

postcoital pain, and exacerbation of pain after prolonged standing (Beard et al. 1988). Taylor's original observations included abnormal ovarian morphology in the presence of venous congestion and it is possible that a basis in ovarian endocrine dysfunction may exist: associated ovarian morphology is characterized by predominantly atretic follicles scattered throughout the stroma, while in contrast to polycystic ovary syndrome the volume of the ovary is normal. The thecal androstenedione response to LH was increased as in polycystic ovarian syndrome, but granulosa cell estradiol production was reduced compared to normal tissue (Gilling-Smith et al. 2000).

Imaging features of pelvic congestion are dilated uterine and ovarian veins with reduced venous clearance of contrast medium. Ovarian vein reflux seen during transuterine venography was not included as a necessary condition for this diagnosis in the original scoring system, which includes the diameter of the ovarian veins, the distribution of vessels, and delay in clearance of contrast medium. In pregnancy, massively dilated ovarian pelvic veins are seen on ultrasound or visualized at Cesarean section: these are not normally associated with pain probably because these dilated vessels are characterized by high rates of flow.

There is evidence for therapeutic benefit in these patients of reassurance based on the concept of pelvic congestion, thus explanation of their pain in terms of a functional condition similar to cerebral migraine may be appropriate rather than explanations in terms of an anatomical abnormality or progressive pathological condition. Other approaches to therapy have included stress reduction and hormonal therapy with progestogens. Medroxyprogesterone acetate 50 mg as daily dosage has been shown to be effective, (Farquhar et al. 1989) and GnRH agonists with or without estrogen "add-back" are increasingly used in this indication, with some RCT evidence for benefit (Soysal et al. 2001). Hysterectomy and bilateral salpingo-oophorectomy followed by long-term estrogen replacement therapy is an option for those who have extreme symptoms partially or temporarily relieved by hormonal therapy, but this is naturally a treatment of a last resort.

Patients presenting with vulval varices outside of pregnancy, especially those with other sites of peripheral venous disease represent a different clinical entity to "pelvic congestion syndrome" and the underlying disorder may be nonfunctionality of valves in the pelvic veins together with more prominent anastomoses to the ovarian veins. A surgical approach involving extraperitoneal dissection of the ovarian veins has been described for this condition (Hobbs 1976), although details of patient outcomes are lacking in the literature. This is the group of patients that has been evaluated using interventional radiology techniques for vein occlusion in the last 10–15 years. Using percutaneous selective catheterization of the ovarian veins the presence of reflux has been considered diagnostic and to represent an indication for embolotherapy. Selective catheterization studies do not always evaluate the uterine veins and do not include venous clearance of contrast medium in the assessment of congestion, and unfortunately have not always included detailed clinical information. The term "pelvic venous incompetence" has been seen in the literature, emphasizing the presence of "varices" meaning dilated veins, but making no specification regarding reflux or venous clearance (Venbrux et al. 2002). For research and for clinical assessment purposes, it is therefore important to strive for clarity about two possibly distinct conditions as follows:

1. Women presenting with significant symptoms of pelvic pain and who are found to have 'pelvic congestion' including dilated vessels with reduced clearance, but not necessarily ovarian vein reflux. This clinical presentation can be classified as 'pelvic congestion syndrome'.
2. Women presenting with vulval varicosities or varices (outside pregnancy) and ovarian vein reflux, with or without pelvic pain.

It is also necessary to consider individuals who are asymptomatic but have either "pelvic congestion" or ovarian vein reflux at venography, MR imaging, or ultrasonography: in this context the imaging findings are likely to be coincidental. Unfortunately, even current reports tend to confuse the diagnostic categories and give incomplete clinical data about the patients included. Van der Vleuten and colleagues report positive outcomes for embolization in "pelvic congestion syndrome" with statistically significant change in summed symptom scores from mean of 26 (on a scale of 10–50) before embolization to 21 two months after the first embolization and to 19 at the time the survey was completed, but do not report detailed symptomatic information, such as presence of dyspareunia or pain scores (van der Vleuten et al. 2012).

Below, evidence from anatomic, physiologic, and imaging studies that might underpin an understanding of the clinical spectrum of pelvic congestion and ovarian vein reflux is reviewed.

2   Anatomy

Consistent with the embryologic origin of the uterus and ovaries, the ovarian arteries in humans arise from the aorta at a level below the origin of the renal arteries, with a variant course arching over the renal veins in some cases. Other anatomic studies confirm that the left ovarian vein consistently joins the left renal vein. On the right, the ovarian vein usually joined the inferior vena cava directly, but joined the right renal vein in 8.8 % of cases. With regard to valves, these have been described as either usually absent, or present in up to 90 % of cases; in the latter study valves were more

likely to be absent in parous women. Taken together, the cadaver studies suggest that where present, reflux down the ovarian vein is a functional rather than anatomic phenomenon. Valves are sometimes encountered during ovarian venography, but their absence should not be considered abnormal. The spermatic vein is rather longer than the ovarian vein, and the need for valves in the male and their failure leading to varicocele is not an appropriate analogy for pelvic congestion in the female. While ovarian vein reflux may be more demonstrable on the left than the right, there is no evidence for any predominance of left sided symptoms, whether of pain, dyspareunia, or vulvar varicosity, in contrast to varicocele. Valves are identified in branches of the internal and external iliac veins in around 10 % of male and female cadavers, indicating that venous return in iliac vessels also is nondependent on competent valves (Lepage et al. 1991).

A number of authors have drawn attention to the complex structural relations of the uterine and ovarian arteries and veins. In some species, local hormonal influences apparently transmitted through veno-arterial shunts are important in the regulation of the corpus luteum but this is not thought to be a factor in human luteal function. However, the concept of countercurrent exchange between human utero-ovarian veins and arteries has received some experimental support. The human ovarian circulation undergoes changes at the menarche, during the menstrual cycle, in pregnancy, and at the menopause, both in large vessels and at the level of the capillary network. The different phases of reproductive life are associated with changes both in size and volume flow in the uterine and ovarian arteries and veins. In pregnancy, although the ovaries are inactive, markedly dilated ovarian veins contribute to the venous drainage of the uterus. Thrombosis of massively dilated ovarian veins is a rare cause of acute abdominal pain in the puerperium (Savader et al. 1988).

Some of the changes in the uterine and ovarian veins may be a consequence of fluctuating levels of ovarian steroid hormones. During the normal menstrual cycle, the ovarian veins are exposed to 100-fold higher concentrations of estrone and estradiol compared to peripheral plasma (Baird and Fraser 1975). Although data are not available for human vessels, in oophorectomized mice the uterine and ovarian veins, but not the femoral or iliac veins or inferior vena cava, enlarged in response to estradiol or testosterone administration. This suggests that uterine and ovarian vessels have a special sensitivity to ovarian steroid hormones.

3 Vascular Physiology

Venoconstriction has a homeostatic role in maintaining cardiac output in response to changes of posture, and is under sympathetic control. Veins may also respond to local pressure changes with myogenic activity sufficiently coordinated to result in a peristalsis-like movement of blood back to the heart. In the absence of tissue supports and the variable presence of valves, venous return in the utero-ovarian circulation is likely to be aided by spontaneous contractility. This has been observed in vitro and in vivo (Stones et al. 1990). The full range of endothelial and perivascular autonomic innervation is present in the human ovarian vein, and has been demonstrated experimentally the release of vasoactive agents from the isolated perfused human ovary. Many of these agents are mediators of inflammation and pain sensation, providing a link between vascular phenomena and pain. Relevant mechanisms have been reviewed (Stones 2000). It may be that pelvic congestion reflects a systemic disturbance of vasomotor regulation.

4 Ultrasound Imaging

Dilated pelvic veins can be seen using transabdominal or transvaginal sonography. However, the use of ultrasound to replace venography has proved problematic, especially because reflux at the origin of the ovarian vein is difficult to visualize, and flow rates are typically very low making it difficult to obtain a satisfactory spectral display using Doppler. Thus, the venous clearance element of pelvic congestion, well seen using transuterine venography, is difficult to reproduce. Comparing the two modalities, the technical limitation of conventional Doppler was overcome using transvaginal power Doppler, which has much greater sensitivity to low rates of flow. However, in a comparison with transuterine venography the correlation between findings in 42 women was poor. Thus, venography may continue to have a place (Campbell et al. 2003). More recently, dynamic MRI may have come to represent the "gold standard".

5 Imaging Studies with Renal Transplant Donors

Healthy kidney donors are evaluated using angiography, CT, and/or MRI before surgery to assure normal anatomy. Observations in donors have been reported in three studies. A total of 27/273 women had evidence of left ovarian venous reflux of whom 22 completed a questionnaire about symptoms. Of these, 13 reported pelvic pain and 10 had reduced or absent symptoms after left nephrectomy (Belenky et al. 2002). By contrast, in two other studies in this group involving 8 and 16 women, while the ovarian vein diameters of donors with evidence of reflux were greater than those without, none had symptoms of pelvic

pain. A possible explanation for the discrepant findings is the lack of prospective symptom data collection from the donors, with or without venous reflux, which makes the true significance of reflux difficult to assess.

6 Clinical Outcomes

In considering the outcomes of treatment, it is important to keep in mind the diverse uses of the diagnostic label of "pelvic congestion" as discussed earlier. The available evidence for the benefit of interventions for pelvic congestion based on randomized clinical trials is limited and hormonal interventions predominate: other interventions are supported only by observational studies (Stones et al. 2005). A recent report of symptomatic improvement with Implanon, a contraceptive implant, is of interest because of its wide availability internationally, the long duration of action and a good adverse effect profile (Shokeir et al. 2009). In interventional radiology studies, symptom improvement is noted in between half and 90 % of patients. As a group these studies are difficult to interpret because of variable entry criteria, incomplete documentation of clinical symptoms, and the duration and completeness of follow-up (Maleux et al. 2000; Venbrux et al. 2002). One report emphasized the presence of dyspareunia as indicating a poor outcome following embolotherapy (Capasso et al. 1997), while others have reported improvement in this symptom after treatment. Laparoscopic surgical experience of ovarian vein ligation is anecdotal. An early report (Takeuchi et al. 1996) described two successful cases although as in the radiologic literature clinical details are sparse.

7 Conclusion

More than half a century after Taylor put forward the concept of pelvic congestion, how much further forward are we? Clearly, understanding of basic mechanisms of vascular control and pain has progressed considerably, but specific pharmacotherapy directed toward a possible systemic vascular abnormality remains elusive. However, we have randomized clinical trial evidence of benefit for medical treatments of pelvic congestion. The challenge is for gynecologists and radiologists to work together to agree diagnostic criteria and to present carefully documented studies of the clinical outcomes of radiologic interventions. As noted in a recent systematic review, "controlled trials comparing medical and interventional treatments are urgently needed for pelvic congestion syndrome (PCS)-associated pelvic pain" (Tu et al. 2010).

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