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What is the significance of impaired uterine vein blood flow from prolapse?

Traian ENACHE, Diana Elena SOARE

Department of Obstetrics and Gynecology, University Hospital of Obstetrics and Gynecology "Prof. Dr. Panait Sarbu"

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ABSTRACT

Objective: Pelvic organ prolapse (POP) has an important impact on pelvic vasculature consisting of obstruction and consecutive stasis with possible multiple effects on different organs.

Materials and Methods: We examined a group of 13 patients with 3rd and 4th degree POP. The subjects were assessed clinically and using a Voluson E8 with a 5 mHz vaginal probe, before and after the gentle reduction of the prolapse. The parameter measured by ultrasound was the resistivity index (RI) on uterine arteries measured transvaginally.

Results: Both uterine artery RIs were significantly lower after the reduction the prolapse ($p<0.01$). This might be interpreted as a pelvic venous stasis associated with POP, which improves after the above mentioned manoeuvre.

Conclusion: Uterine vessels are obstructed by POP. Back pressure from obstructed veins due to POP might induce a dilation in low-pressure veins causing haemorrhoids. Prior to the consideration of the surgical excision of haemorrhoids, it may be worthwhile performing a doppler ultrasound test and correcting the prolapse if the result is positive.

Keywords: Haemorrhoids; pelvic floor; uterine artery Doppler

INTRODUCTION

Pelvic organ prolapse (POP) is a disturbing condition with a major impact on a woman's quality of life. The main cause of POP is an alteration of the connective tissue at multiple levels, which leads to a disruption of pelvic anatomy and consecutive function loss.[1] Uterine prolapse is defined as the descensus of the uterus into the vaginal canal. With its relocation, there is significant impact on the uterine vascularization and furthermore on all pelvic vessels.

Uterine descensus causes compression and kinking on the uterine veins with consecutive dilatation which can affect the entire pelvic circulation.[2] If we look at the literature, we discover some articles regarding the pelvic vessels associated with pelvic floor disorders. In 2010, Paradisi et al.[3] mentioned that venous flow is impaired by the protrusion of the anterior rectal wall towards its lumen (Figure 1). Abendstein[2] also concluded that high laxity is an important cause of haemorrhoids, which combined with pelvic venous stasis can explain their presence in women with pelvic organ prolapse[4]. There is also evidence

Address for Correspondence: Traian Enache, Department of Obstetrics and Gynecology, University Hospital of Obstetrics and Gynecology "Prof. Dr. Panait Sarbu"
E-mail: dr.traianenache@gmail.com **ORCID:** orcid.org/0000-0002-0190-1340
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that uterine cervical hypertrophy is in fact caused by oedema of the cervix due to venous stasis in POP. Restoration of normal anatomy leads to vascular decompression and a reversal of cervical length.[5]

Figure 1. *Left:* Haemorrhoids, pre-operative. *Right:* Haemorrhoids, second post-operative day.
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MATERIALS AND METHODS

Our aim was to find a measurable, easy-to-use parameter that describes pelvic vascular flow. In obstetrics, it is common to measure the resistivity index (RI) on uterine arteries, its value being associated with the quality of placentation. Therefore, we measured the RI of the uterine arteries in women with POP. We have obtained two different values characterising two different statuses.

We examined a group of 13 patients with third and fourth degree pelvic organ prolapse as well as high-degree hemorrhoidal disease. These patients were assessed clinically and ultrasonically before and after gentle reduction of the prolapse. In doing so, we tried to reproduce the ideal postoperative status of the patient.

Clinically, we followed the evolution of the haemorrhoidal disease. All patients presented with hemorrhoidal disease and various complaints. In terms of symptomatology, large uterine prolapse and haemorrhoids have multiple similarities. Pruritus can be due to irritation of the haemorrhoidal epithelium as well as vaginal epithelium. Bleeding is a common symptom of haemorrhoidal disease, but it can also occur due to the erosion of the prolapsed uterus. Additionally, rectal fullness or the feeling of incomplete evacuation can be explained by both pathologies. We also used ultrasound Doppler evaluation of the uterine arteries. The usual spectre is shown in Figure 2.

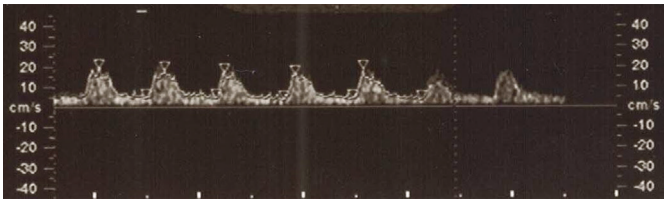

Figure 2. The usual spectre in ultrasound Doppler evaluation.

RI is a calculated flow parameter derived from the maximum, minimum and mean Doppler frequency shifts during a cardiac cycle (RI: peak systolic velocity – end diastolic velocity/peak systolic velocity). Peak systolic velocity is the maximum speed achieved during the cardiac systole and end-diastolic velocity is the minimum speed achieved during the diastole. As a vessel narrows and resistance to flow increases, the RI will increase.

Uterine artery Doppler examination was performed using a Voluson E8 with a 5 mHz vaginal probe. Firstly, a sagittal section of the uterus was obtained while also identifying the internal and external cervical os. Subsequently, by tilting the transducer side to side, both uterine arteries were identified and pulsed wave Doppler was used. Before the reduction of the prolapse, the RI was measured for both uterine arteries and a mean RI was calculated. Following this, the prolapse was gently reduced using the vaginal probe of the ultrasound and the measurements were repeated. In Figure 3, we present the findings from a patient, before (a) and after (b) the reduction of the prolapse.

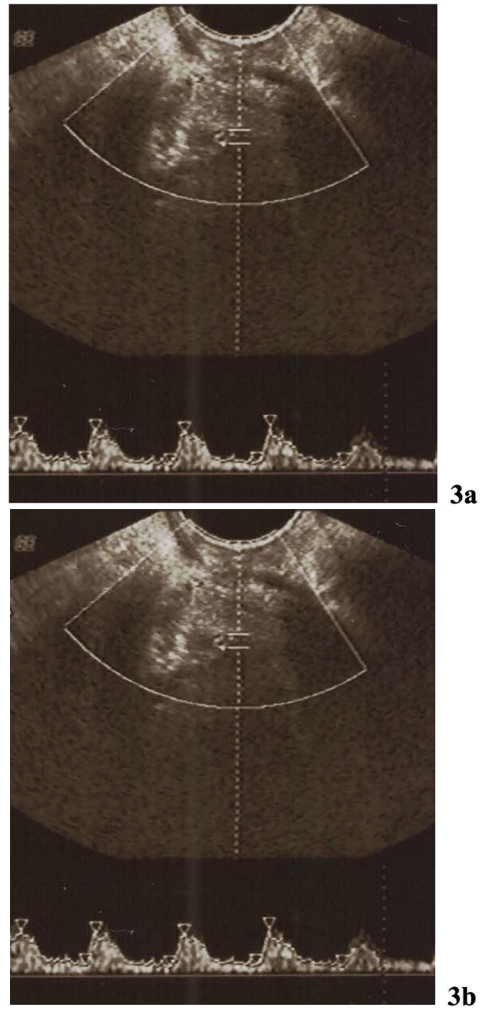

Figure 3. The findings from a patient, before (**a**) and after (**b**) the reduction of the prolapse.

Table 1. Results of the measured parameters (peak systolic flow and end-diastolic flow)

Variable	Probabilistic invariants	Before reduction	After reduction
RI (resistivity index)	M	0.89	0.83
	SD	3.84	1.85
	MSD	0.66	0.32
	p-value	<0.001	
PS (peak systolic flow) (cm/s)	M	12.5	13.6
	SD	1.59	0.87
	MSD	0.28	0.15
	p-value	<0.1	
ED (end-diastolic flow) (cm/s)	M	0.83	2.58
	SD	1.19	0.61
	MSD	0.21	0.1
	p-value	<0.005	

M: mean value; SD: standard deviation; MSD: mean standard deviation for the uterine artery before and after prolapse reduction; *p*-probability

RESULTS

Clinically, after 2 minutes, we observed a significant reduction of the haemorrhoidal enlargement. A reduction of 75% was observed in seven patients, of 50% in another five patients and one patient had an improvement of less than 50%. Since there is no standard classification of external haemorrhoids, the initial degree of enlargement and the postoperative outcome are due to subjective analysis. However, in spite of this, the improvement was visible. Overall symptomatology improved in all 13 patients.

Both uterine artery RIs decreased after the reduction of the prolapse, with a mean RI of 0.89 before and 0.83 after the manoeuvre ($p<0.001$). The other parameters (peak systolic flow and end-diastolic flow) measured showed no significant difference between the two situations. These results are presented in Table 1.

DISCUSSION

Given the significance of the resistive index, after the reduction of uterine prolapse, blood flow improved through the uterine arteries. This shows us that, indeed, the uterine vessels are obstructed by the organ prolapse. Indirectly, we may presume that the veins are also obstructed due to backpressure on their more compressible walls. In our practice, we observed a high incidence of external haemorrhoids in female patients diagnosed with pelvic organ prolapse. We hypothesized that there was a cause-effect relationship which could explain this association. The haemorrhoidal disease improved significantly after the surgical treatment of pelvic organ prolapse in all 13 patients. Thus, starting from the uterine vessels, we can assume that the entire pelvic venous circulation is affected by the organ prolapse, with an impact also on the veins from the anal cushions. Venous stasis is almost always associated with a certain degree of oedema, leading to an even more severe obstruction. A synthesis of the potential pathogenesis of haemorrhoids in patients with POP is presented in Figure 4. Another probable etiopathological factor adding to venous stasis is kinking of the uterine veins as a consequence of the prolapse. Venous kinking can further increase backpressure on the haemorrhoidal veins. We were not able to assess this on Doppler ultrasound at this stage, but it is a potential direction for research.

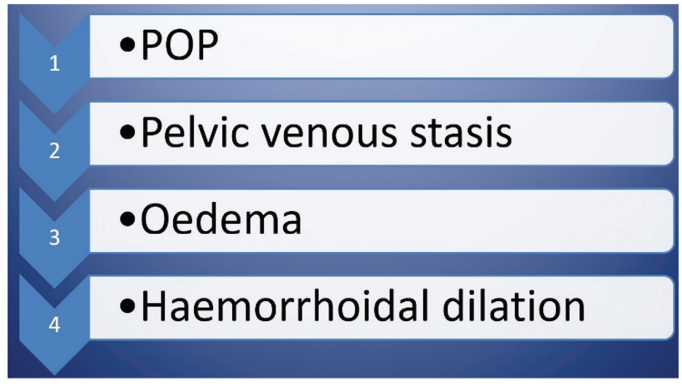

Figure 4. A synthesis of the potential pathogenesis of haemorrhoids in patients with POP.
POP: Pelvic organ prolapse.

We can consider haemorrhoids to have a mixed etiopathogenicity, including collagen dysfunction and pelvic venous stasis. We can find both of these entities in the pathophysiology of pelvic organ prolapse, and furthermore, we can address them. By reinforcing the uterine ligaments and restoring the normal anatomy and thus, restoring normal blood flow, hemorrhoidal disease should also improve. This can also suggest the opposite. Namely, if only the haemorrhoids are treated and a pelvic organ prolapse continues to impair pelvic venous blood flow, this might be a cause of hemorrhoidal relapse.

Complete pelvic examination should be performed in women with hemorrhoidal disease in order to detect if pelvic organ prolapse is present. Treatment of the latter might solve both of the problems in one intervention.

Limitations and future suggestions

An important limitation of this study is the relatively low number of participants. Therefore, a larger group should be examined. We had only an indirect view of the pelvic and especially rectal wall blood flow. We could not measure the diameter of the blood

vessels. This would more decisively validate our hypothesis. However, we were able to measure the internal resistance to blood flow, which is a function of the diameter of the vessel (Poiseuille's Law), resistance being inversely proportional to the fourth power of the radius.[6,7] Our study was conducted in women with third and fourth degree pelvic organ prolapse. As a result of such exponential relationships,[6,7] it is possible that hemorrhoidal disease may be associated with more minor pelvic organ prolapse.

CONCLUSION

Back pressure from obstructed veins due to POP might induce dilation of low-pressure veins and so cause haemorrhoids. In these patients, treatment could aim at the restoration of a normal blood flow (POP surgical cure) instead of focusing on the haemorrhoids only. Prior to consideration of surgical excision of the haemorrhoids, it may be worthwhile performing a doppler ultrasound test and correcting the prolapse if the result is positive. Our findings of uterine vein stasis, though indirect, are suggestive but only sufficient for a hypothesis. We have commenced a protocol to measure the rectal vein flow along with clinical observations before and after mechanical correction of uterine prolapse.

ETHICS

Ethics Committee Approval: Not required since ultrasound is a standard investigative procedure in our hospital.

Informed Consent: Approval was obtained for the test and publication of its deidentified results.

Peer-review: Internally peer-reviewed.

Contributions

Medical Practices: T.E., Concept: T.E., Design: T.E., D.E.S., Data Collection: D.E.S., Analysis and/or Interpretation: T.E., Literature Search: D.E.S., Writing: D.E.S.

DISCLOSURES

Conflict of Interest: No conflict of interest was declared by the authors.

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