

Sealing the Leak: Percutaneous Deep Dorsal Penile Vein Embolization Using Glubran for Venocclusive Erectile Dysfunction - A Case Report

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Case Report

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Abstract

Erectile dysfunction (ED) is highly prevalent, and vascular disease is the leading cause of organic ED, including veno-occlusive dysfunction (VOD), in which impaired restriction of venous outflow from the corpora cavernosa prevents the blood retention needed to maintain an erection. We report a 67-year-old man with controlled hypertension and a 35-pack-year smoking history who presented with a 1.5-year history of ED refractory to sildenafil (IIEF-5 score 10; Erection Hardness Score 2). Penile duplex Doppler ultrasonography following intracavernosal papaverine demonstrated preserved arterial inflow (peak systolic velocity 71.4 cm/s) together with a markedly elevated, persistent end-diastolic velocity (23 cm/s) suggestive of VOD, although inadequate penile rigidity limited definitive assessment. Pelvic arteriography excluded a significant arterial abnormality, and cavernosography confirmed VOD, showing rapid and persistent opacification of the retropubic venous plexus and pelvic veins with failure to sustain an erection despite high-flow injection. Using ultrasound-guided antegrade access through the deep dorsal penile vein, the retropubic venous plexus was embolized with a cyanoacrylate (Glubran) and lipiodol mixture, with a tourniquet applied at the penile base to prevent reflux, and final control angiography showed a satisfactory result. This case demonstrates that endovascular pelvic venous plexus embolization is a feasible, minimally invasive treatment for medically refractory ED due to VOD and underscores the importance of a structured diagnostic pathway combining duplex ultrasonography, arteriography, and cavernosography. To our knowledge, this is the first such procedure reported in Lebanon and the Arab region. Further experience with standardized outcome reporting and longer follow-up is needed to define its durability and role.

Introduction

Erectile dysfunction (ED) is defined as the persistent inability to achieve or maintain a penile erection sufficient for satisfactory sexual performance.¹ It is highly prevalent, affecting approximately 52% of men aged 40–70 years, with prevalence increasing substantially with age.^{2,3} ED may result from several underlying pathologies and is broadly classified as organic, psychogenic, or mixed. Normal penile erection depends on the coordinated interaction of neural, hormonal, vascular, and psychogenic pathways. Parasympathetic stimulation promotes nitric oxide-mediated relaxation of cavernosal smooth muscle and dilation of the penile arteries, thereby increasing arterial inflow. Expansion of the corpora cavernosa subsequently compresses the subtunical venules against the tunica albuginea, restricting venous outflow and maintaining penile rigidity.

Vascular disease is a leading cause of organic ED.⁴ Arterial insufficiency reduces blood flow into the corpora cavernosa, whereas veno-occlusive dysfunction (VOD) impairs the restriction of venous outflow, preventing adequate blood retention and maintenance of an erection.

The diagnostic evaluation of ED begins with a comprehensive medical and sexual history, including assessment of cardiovascular risk factors, psychological health, hormonal status, and medication use.¹ Initial management includes modification of reversible risk factors, such as diabetes mellitus,

hypertension, dyslipidemia, smoking, obesity, and metabolic syndrome, together with first-line pharmacologic therapy using phosphodiesterase type 5 inhibitors, such as sildenafil. Persistent symptoms despite appropriate medical therapy may prompt further evaluation for an underlying vascular abnormality. Penile duplex Doppler ultrasonography is commonly used as the initial vascular imaging modality, whereas cavernosography, cavernosometry, computed tomography angiography, and catheter angiography may be used in selected patients to further characterize venous or arterial abnormalities.⁵ Patients with medically refractory ED have traditionally required treatment escalation to intracavernosal injections, vacuum erection devices, surgical venous ligation, or penile prosthesis implantation.⁶

More recently, endovascular interventions, including venous embolization for VOD and angioplasty or stenting for arterial insufficiency, have emerged as minimally invasive treatment options for carefully selected patients with vasculogenic ED.¹

We report the case of a 67-year-old man with medically refractory ED secondary to VOD who underwent successful pelvic venous plexus embolization. To our knowledge, this represents the first reported experience with this procedure in Lebanon and the Arab region.

Case Presentation

A 67-year-old man with controlled hypertension was referred from the sexual health clinic to the interventional radiology department for further evaluation of a 1.5-year history of erectile dysfunction refractory to sildenafil. He is an active smoker with a 35-pack-year smoking history and reports a sedentary lifestyle. The severity of erectile dysfunction was assessed using the five-item International Index of Erectile Function (IIEF-5) and the Erection Hardness Score (EHS). At presentation, his IIEF-5 and EHS scores were 10 and 2, respectively.

Penile duplex Doppler ultrasonography demonstrated normal echotexture of the corpora cavernosa and corpus spongiosum. The testes appeared normal, while the prostate demonstrated a prominent median lobe. Mild narrowing of the common iliac arteries was also noted. Baseline cavernosal artery velocities in the flaccid state ranged from 6 to 8 cm/s (**Fig. 1**). Following intracavernosal administration of 80 mg of papaverine into the right corpus cavernosum, suboptimal, nonrigid tumescence was observed after 15 minutes. Peak systolic velocity reached 71.4 cm/s, indicating preserved arterial inflow. However, a markedly elevated and persistent end-diastolic velocity of 23 cm/s was observed, supporting the diagnosis of veno-occlusive dysfunction (**Fig. 2**).

Figure 1. Pre-Op Pre-papaverine injection

Figure 3. Angiogram showing patent bilateral iliac systems

However, failure to achieve and sustain adequate penile rigidity during duplex Doppler ultrasonography limited definitive assessment of veno-occlusive function, prompting further evaluation with arteriography and cavernosography. Right brachial arterial access was obtained, and pelvic angiography, including

bilateral iliac and selective internal iliac arteriography, demonstrated no significant arterial abnormality (Fig. 3).

After ruling out arterial insufficiency as the main contributor for the patient's ED, a cavernosography was then performed to assess for venous leak and associated VOD. The right corpus cavernosum was punctured using a 20-gauge needle, followed by sequential intracavernosal injections of diluted iodinated contrast before and after administration of 80 mg of papaverine. A total of 150 mL of iodixanol (Visipaque) was administered during the procedure. Pre-papaverine cavernosography demonstrated normal cavernosal morphology but marked abnormal venous drainage through the retropubic venous plexus and pelvic veins, without achievement of adequate penile rigidity. Following papaverine administration, an erection was achieved but could not be sustained despite continued high-flow intracavernosal injection. Persistent rapid opacification of the pelvic venous drainage pathways confirmed significant veno-occlusive dysfunction (Fig. 4).

After ultrasound-guided puncture of the deep dorsal vein of the penis and insertion of a microcatheter, fluoroscopy-guided microcatheter was advanced down to the confluence of the retropubic venous plexus. The position of the catheter was confirmed by fluoroscopy. A tourniquet was then applied at the base of the penis to prevent any backflow of embolization material into the penile body. The venous plexus was then embolized using a mixture of Cyanoacrylate glue (Glubran) and lipiodol at 1:3. The final control angiograms performed show a very satisfactory result (Fig. 5).

At 3-month follow-up, penile duplex Doppler ultrasonography demonstrated a substantial decrease in end-diastolic velocity from 23 cm/s before embolization to 8.6 cm/s. Following intracavernosal administration of 80 mg of papaverine into the right corpus cavernosum, rigid tumescence was achieved within 15 minutes. His IIEF-5 and EHS scores improved to 22 and 4, respectively. However, a persistent end-diastolic velocity of 8.6 cm/s remained, indicating a partial hemodynamic response to embolization with residual veno-occlusive dysfunction (Fig. 6,7). The patient's full clinical course is summarized chronologically in Table 1.

Figure 7. Post-Op Post-Papaverine

Figure 7. Post-Op Pre-Papaverine

Table 1
Structured Clinical Timeline in accordance with the CARE guidelines

Timepoint	Clinical Event
Referral and presentation	67-year-old man with controlled hypertension and a 35-pack-year smoking history referred from the sexual health clinic for a 1.5-year history of erectile dysfunction refractory to sildenafil. IIEF-5 score 10; Erection Hardness Score 2.
Initial duplex Doppler ultrasonography	Baseline and post-papaverine penile duplex Doppler ultrasonography demonstrated preserved arterial inflow (peak systolic velocity 71.4 cm/s) with a markedly elevated, persistent end-diastolic velocity (23 cm/s) suggestive of veno-occlusive dysfunction; inadequate penile rigidity limited definitive assessment.
Pelvic arteriography	Right brachial arterial access; bilateral iliac and selective internal iliac arteriography demonstrated no significant arterial abnormality, excluding arteriogenic erectile dysfunction.
Cavernosography	Sequential intracavernosal contrast injections before and after papaverine administration showed rapid, persistent opacification of the retropubic venous plexus and pelvic veins with failure to sustain an erection, confirming veno-occlusive dysfunction.
Percutaneous embolization	Ultrasound-guided antegrade access through the deep dorsal penile vein; microcatheter advanced to the retropubic venous plexus; tourniquet applied at the penile base; embolization performed with a cyanoacrylate (Glubran)/lipiodol mixture (1:3). Final control angiography showed a satisfactory result.
3-month follow-up	Repeat duplex Doppler ultrasonography showed a decrease in end-diastolic velocity from 23 to 8.6 cm/s. IIEF-5 and EHS scores improved to 22 and 4, respectively, with rigid tumescence achieved. A residual end-diastolic velocity of 8.6 cm/s indicated a partial hemodynamic response.

Discussion

Vasculogenic disease underlies the majority of organic erectile dysfunction, and among vascular causes, arterial insufficiency and veno-occlusive dysfunction (VOD) each account for roughly half of cases.⁴ VOD develops when the corporo-veno-occlusive mechanism fails to compress the subtunical venules against the tunica albuginea during tumescence, permitting persistent venous outflow that prevents the blood trapping required to sustain rigidity. Proposed mechanisms include incomplete cavernosal smooth muscle relaxation arising from endothelial or neurotransmitter dysfunction, degeneration of the cavernosal smooth muscle, and localized failure of tunical or subtunical venous compression.⁷ Our patient's age, extensive tobacco use, and sedentary lifestyle are consistent with the gotten, degenerative end of this spectrum rather than the congenital venous leak more typical of younger men.

The diagnosis of VOD relies on combined functional and morphological assessment. Penile duplex Doppler ultrasonography after intracavernosal vasodilator injection is the recommended first-line vascular study, distinguishing arterial insufficiency from venous leak: a preserved peak systolic velocity

(PSV) establishes adequate arterial inflow, whereas a persistently elevated end-diastolic velocity (EDV) with a low resistive index (RI) reflects failure of venous occlusion.⁵ Reported thresholds for VOD include a PSV above 25 cm/s together with an EDV persistently above 5 cm/s in the rigid phase and an RI below 0.75.⁶ In our patient, a PSV of 71.4 cm/s confirmed normal arterial inflow, while the markedly elevated and persistent EDV of 23 cm/s strongly supported VOD. The failure to achieve full rigidity during the study did, however, limit definitive interpretation, since venous competence cannot be reliably assessed in the absence of adequate tumescence, a recognized limitation of duplex sonography that often prompts confirmatory testing.⁶

For this reason, dynamic cavernosometry and cavernosography remain the accepted reference standard for confirming venous leak and mapping abnormal drainage before intervention.⁶ In our case, cavernosography demonstrated rapid and persistent opacification of the retropubic venous plexus and pelvic veins with an inability to sustain an erection despite high-flow injection, confirming the diagnosis and identifying the embolization target. This sequential, multimodal pathway (duplex screening, angiography to exclude arterial disease, and cavernosography to characterize the leak) reflects current recommendations for selecting candidates for endovascular therapy.⁴

Management of ED follows a stepwise escalation, beginning with modification of reversible risk factors and phosphodiesterase type 5 inhibitors as first-line pharmacotherapy; patients refractory to these measures have traditionally faced escalation to intracavernosal injection, vacuum erection devices, surgical venous ligation, or penile prosthesis implantation.⁶ Surgical ligation of the penile draining veins, however, has produced disappointing long-term outcomes, with high recurrence rates attributed to the development of collateral venous channels, and has been abandoned.^{8;9} These limitations have driven interest in minimally invasive endovascular alternatives.

Transcatheter venous embolization has emerged as a safe and effective option for carefully selected patients with medically refractory VOD, with reported technical success rates ranging from approximately 86% to 97% and more variable clinical success depending on patient selection and outcome definitions.⁶ In a retrospective series of 29 men treated with N-butyl-2-cyanoacrylate, embolization achieved technical success in 93.1% and clinical improvement in 88.8% without any major or minor complications.⁷ More recent prospective data using an antegrade approach through the deep dorsal penile vein with a cyanoacrylate-based liquid embolic agent reported procedural success in 98% of 50 patients and a clinically meaningful IIEF improvement in 68% at six weeks, again without major adverse events.⁴ The antegrade deep dorsal vein access used in our patient mirrors this evolving technique, which provides direct access to the retropubic and periprostatic venous plexus and appears advantageous relative to retrograde approaches.⁶

Application of a tourniquet at the base of the penis during injection, as performed in our case, is an important safeguard against reflux of embolic material into the corpora and the systemic circulation. Although these results are encouraging, the available evidence remains limited to relatively small series

and case reports, and long-term durability data are sparse; recurrence due to recanalization or recruitment of collateral drainage pathways remains a concern warranting longer follow-up^{6,7}.

To our knowledge, this is the first reported case of pelvic venous plexus embolization for veno-occlusive ED performed in Lebanon and the Arab region. It proves the feasibility of offering this minimally invasive option to appropriately selected patients in settings where it was not previously available and underscores the importance of a structured diagnostic pathway in showing candidates likely to benefit. Continued accumulation of cases with standardized outcome reporting and longer follow-up will be essential to define the durability and proper role of this technique within the broader treatment algorithm for refractory vasculogenic ED.

Conclusion

This case shows endovascular pelvic venous plexus embolization as a minimally invasive treatment option for erectile dysfunction caused by veno-occlusive dysfunction that is refractory to phosphodiesterase type 5 inhibitors. It highlights the value of a structured, stepwise diagnostic pathway. This experience reinforces that cavernosography remains essential when duplex ultrasonography is non-diagnostic. Treatment was performed using antegrade access through the deep dorsal penile vein with a cyanoacrylate lipiodol embolic mixture, achieving technical success with a satisfactory final angiographic result. To our knowledge, this is the first such procedure reported in Lebanon and the Arab region, demonstrating its feasibility in settings where it was not previously available. Further experience with standardized outcome reporting and longer-term follow-up will be necessary to set up the durability of this technique and define its role in the management of refractory vasculogenic erectile dysfunction.

Declarations

Ethics approval and consent to participate

This case report was exempt from ethics committee approval in accordance with institutional policy.

Consent for publication

Written informed consent was obtained from the patient for publication of this case report and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal."

Competing interests

The authors declare that they have no competing interests.

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Author Contribution

R.J. and J.E.K. performed the clinical evaluation, the diagnostic imaging workup, and the embolization procedure, and interpreted the imaging studies. R.R.K. conceived the case report. E.I. conducted the literature review and wrote the main manuscript text. E.I. and R.R.K. prepared Figures 1 to 7 and wrote the figure legends. K.K. contributed to the interpretation of the findings and critically revised the manuscript for important intellectual content. J.E.K. supervised the project. All authors reviewed and approved the final manuscript.

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Data Availability

All data supporting this case report are included in the article. The underlying patient medical records are not publicly available to protect patient confidentiality

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Figures

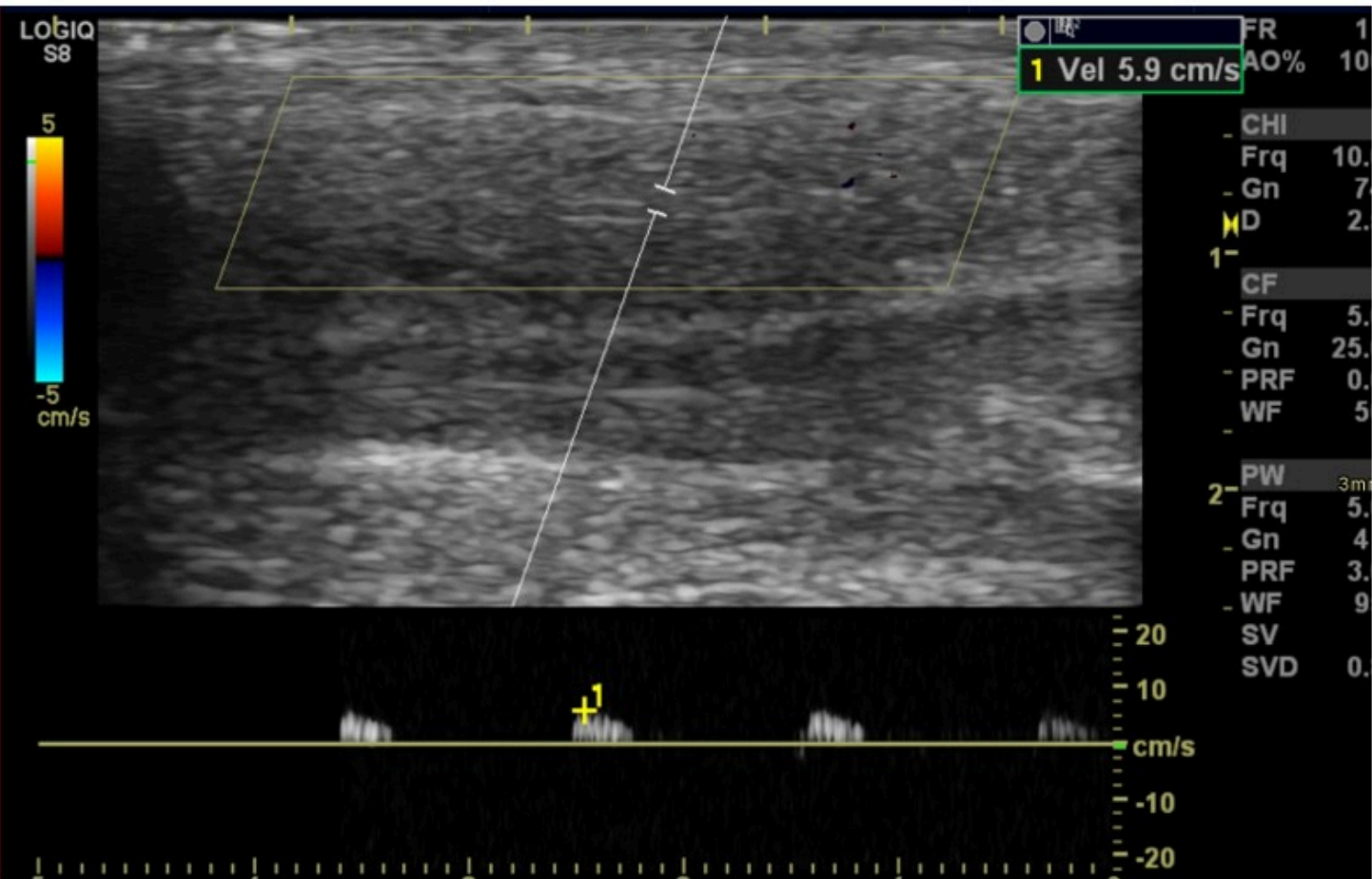


Figure 1

Pre-Op Pre-papaverine injection

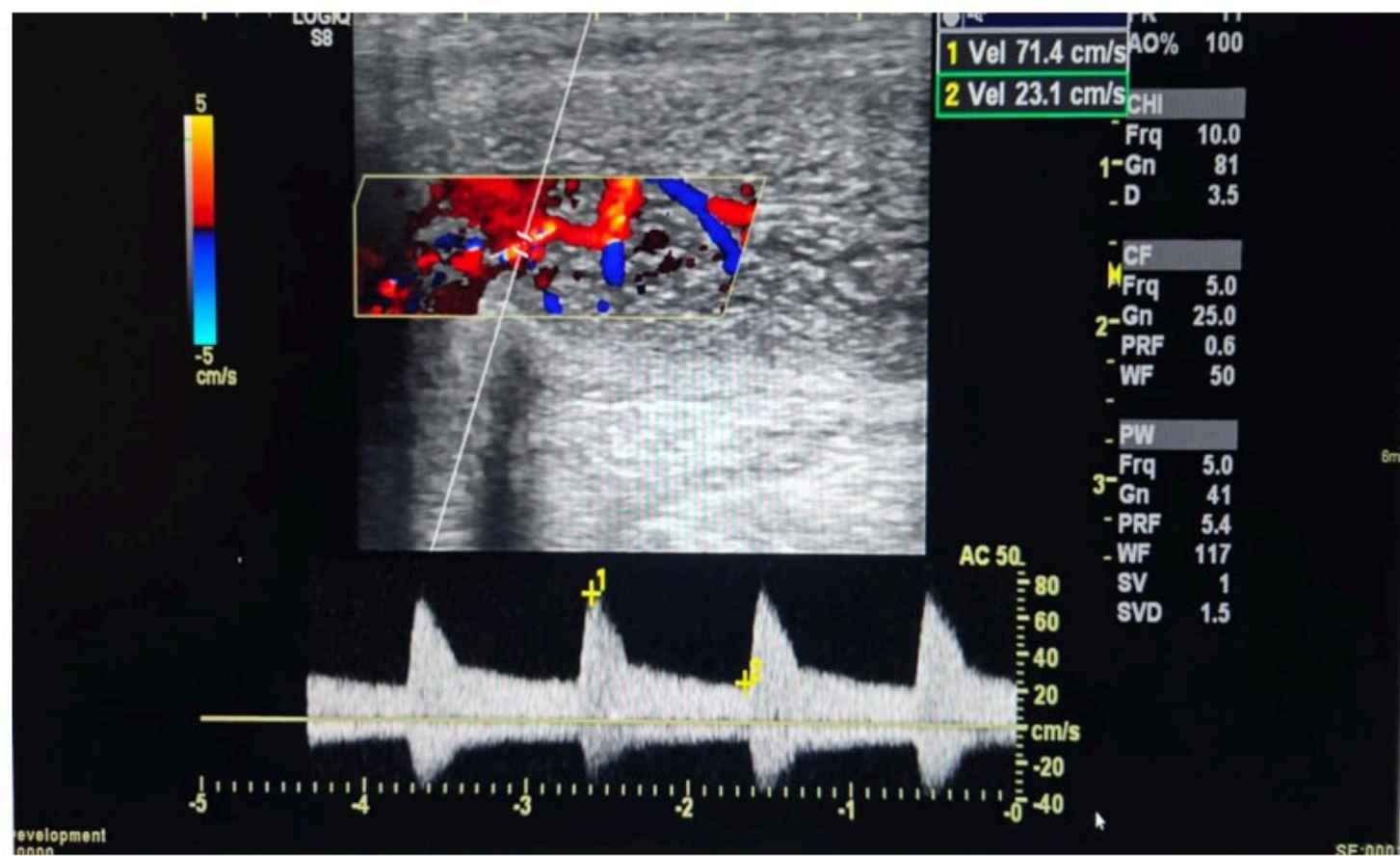


Figure 2

Pre-Op Post-Papaverine injection

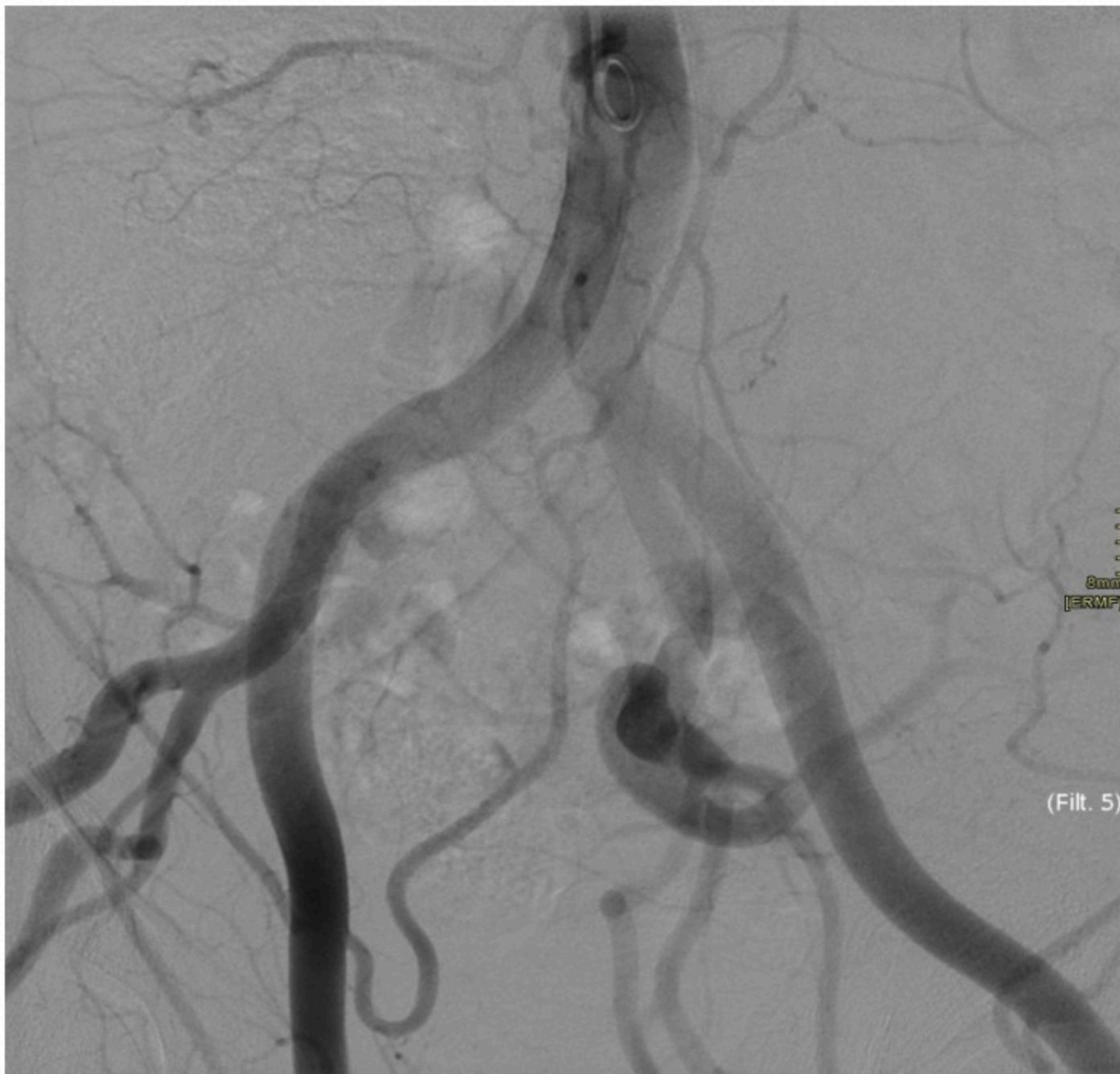


Figure 3

Angiogram showing patent bilateral iliac systems

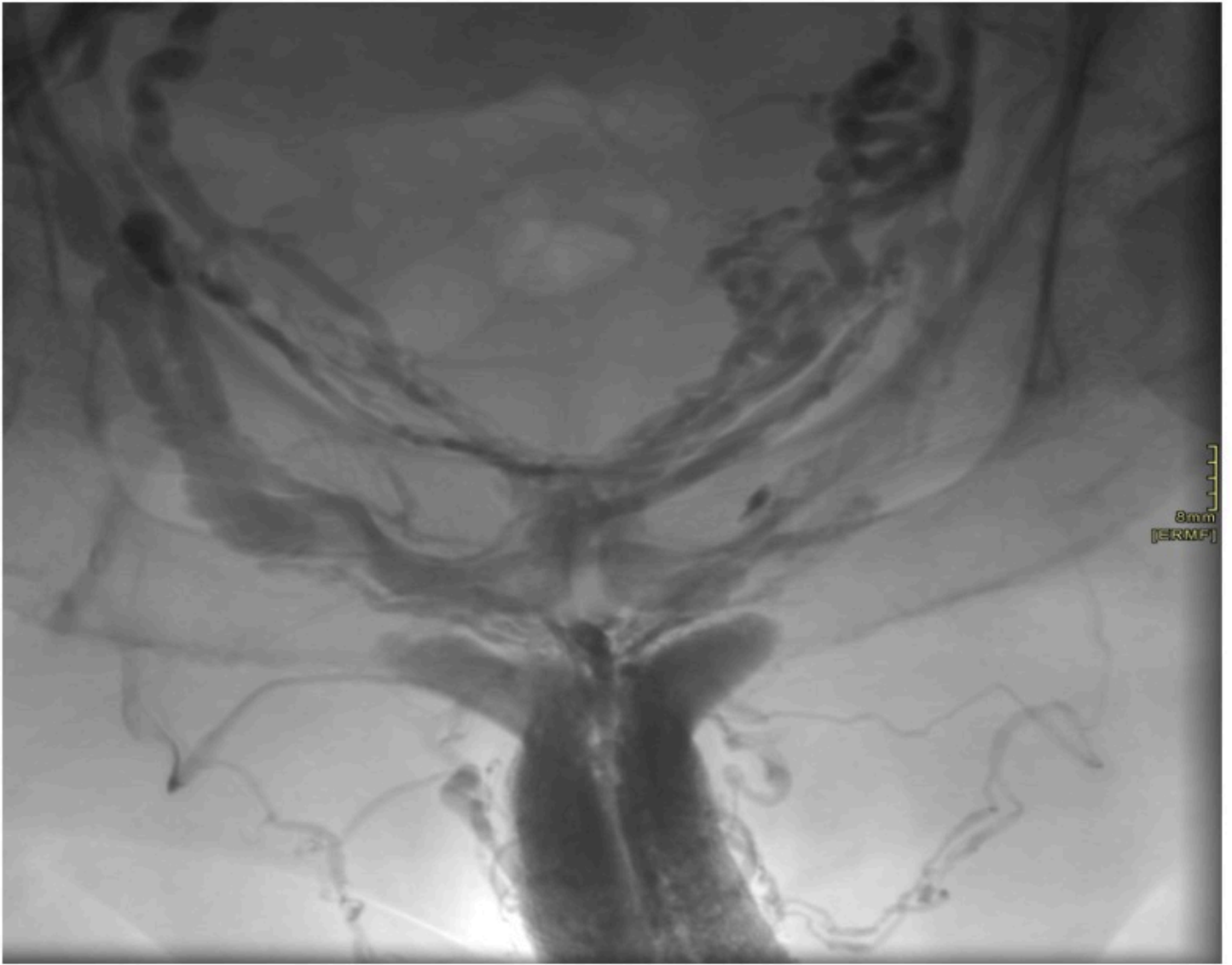


Figure 4

Cavernosogram revealing significant retropubic venous leakage confirming veno-occlusive dysfunction



Figure 5

Angiogram portraying successful prostatic and vesical venous plexus embolization



Figure 6

Post-Op Pre-Papaverine

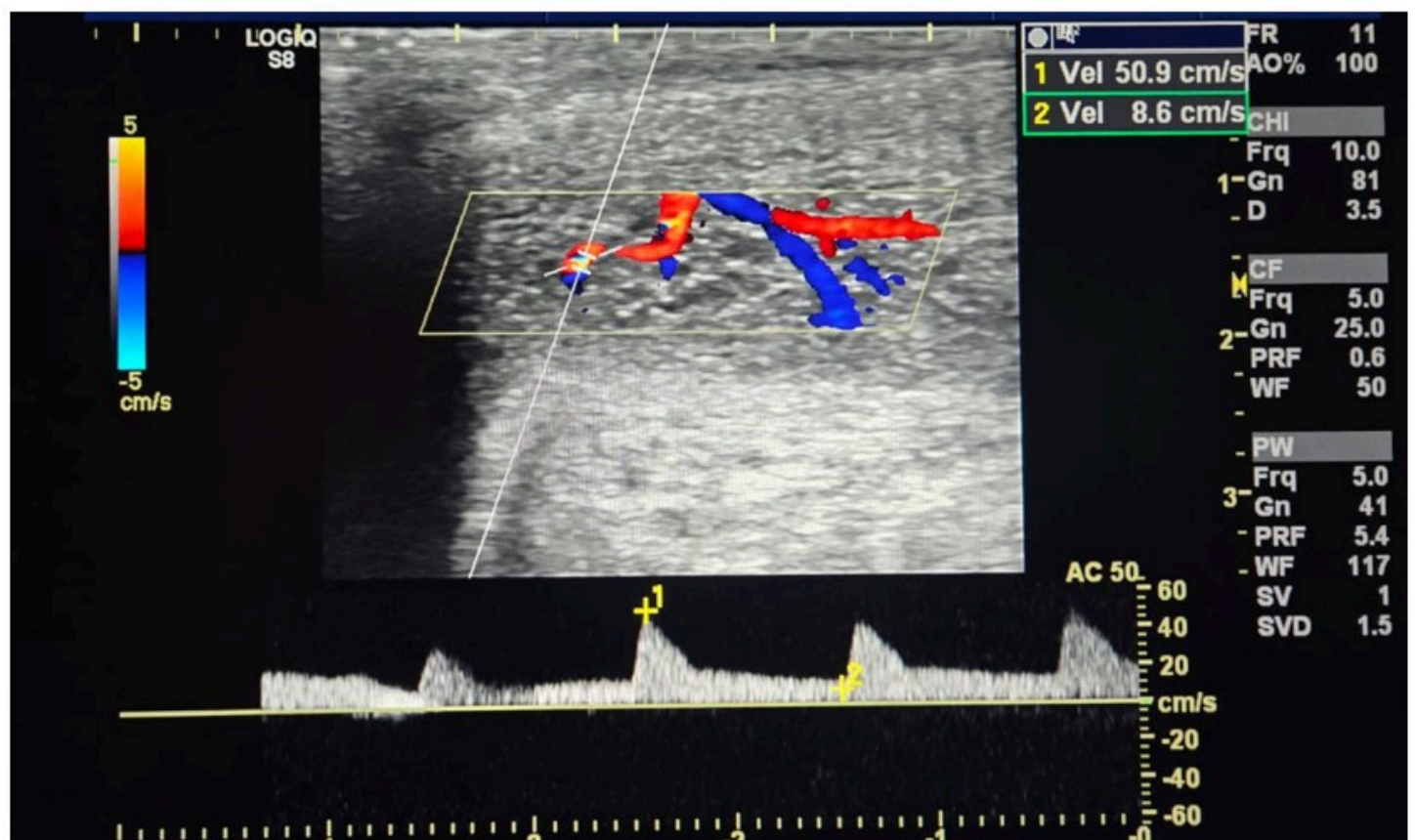


Figure 7

Post-Op Post-Papaverine

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