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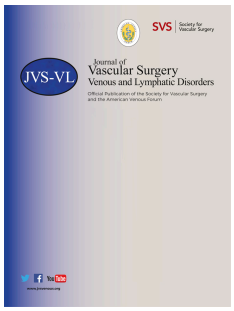

Pregnancy after iliac vein stenting for pelvic venous insufficiency

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PII: S2213-333X(21)00487-X

DOI: https://doi.org/10.1016/j.jvsv.2021.09.005

Reference: JVSV 1328

To appear in: *Journal of Vascular Surgery: Venous and Lymphatic Disorders*

Received Date: 8 June 2021

Accepted Date: 15 September 2021

Please cite this article as: P. Pappas, G. Lakhanpal, T. Soto, Z. Deol, R. Kennedy, S. Lakhanpal, Pregnancy after iliac vein stenting for pelvic venous insufficiency, *Journal of Vascular Surgery: Venous and Lymphatic Disorders* (2021), doi: https://doi.org/10.1016/j.jvsv.2021.09.005.

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Pregnancy after iliac vein stenting for pelvic venous insufficiency

R3WC: 354/2032

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Presented at the 34th Annual Meeting of American Vein and Lymphatic Society

October 15th-18th, 2020, Washington, D.C.

This research was funded by a grant from the Lakhanpal Vein Foundation

ARTICLE HIGHLIGHTS

Type of Research: Multi-center retrospective cohort study.

Key Findings: In 15 women with 16 iliac vein stents and 17 pregnancies, stents remained patent without stent or stent related pregnancy complications during and after pregnancy. Patients were treated with Lovenox during 11 of 17 pregnancies as prophylaxis for stent thrombosis prevention.

Take home message: Iliac vein stents tolerate a gravid uterus well. No stents thrombosed during or after pregnancy and none required re-intervention secondary to pregnancy related compression. Potential pregnancy should not be considered a contra-indication to iliac vein stenting for the treatment of pelvic venous insufficiency.

Table of Contents Summary: From January 2014 to June 2019, 15 women with 16 iliac vein stents who had subsequent pregnancies were identified. No pregnancy related stent complications/reinterventions were required. Patients were treated with Lovenox during 11 of 17 pregnancies as prophylaxis for stent thrombosis prevention.

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Abstract

Introduction: The utilization of iliac vein stenting for the treatment of pelvic pain secondary to pelvic venous insufficiency has significantly increased. In women of child bearing age, the effect of the gravid uterus on stent function and patency is unclear. The purpose of this investigation was to determine the effect of pregnancy on stent patency and reintervention rate in women with iliac vein stents.

Methods: A retrospective chart review and email survey was performed to identify women treated at the Center for Vascular Medicine (CVM) who were treated with iliac vein stenting and who had subsequent pregnancies. Medical and surgical co-morbidities, stent type, location, length, number of stents, re-intervention rates, number of pregnancies after stenting, anticoagulation usage during pregnancy and type of delivery were assessed.

Results: From January 2014 to December 2020, 15 women with 16 iliac vein stents and who had 17 subsequent pregnancies were identified. The average age at stenting was 35.3±4.13 years. The average interval between stenting and conception was 350±287 days. Prior to pregnancy, stent location was in the right common/right external iliac veins in one patient and left common/external iliac veins in 14 patients. Average stent diameter and length was 19.6±3 and 79.5±20.3 millimeters respectively. Thirteen Boston Scientific Wallstents™ and three Bard Venovo™ stents were utilized prior to pregnancy. One patient with a Wallstent™ required a stent extension prior to pregnancy and one patient had two stents placed at the initial procedure. Two women were pregnant twice after stenting for a total of 17 pregnancies. There were 16 term and one premature delivery of single infants. Patients were treated with Lovenox for stent

thrombosis prophylaxis in 11 of 17 pregnancies, five had no prophylaxis and the status of one pregnancy is unknown. One asymptomatic patient underwent a stent venoplasty after delivery.

Conclusions: Iliac vein stents tolerate a gravid uterus well. No stents thrombosed during or after pregnancy and none required re-intervention secondary to pregnancy related compression. Anticoagulation with low molecular weight heparin should be considered for stent thrombosis prophylaxis. Potential pregnancy should not be considered a contra-indication to iliac vein stenting for the treatment of symptomatic pelvic venous insufficiency.

Introduction

Pelvic venous insufficiency (PVI) secondary to iliac vein outflow obstruction is a common cause of pelvic pain with or without lower extremity pain and swelling[1-6]. The majority of patients with symptomatic PVI in patients with iliac vein stenosis, present with a non-thrombotic iliac vein stenosis[1-3, 7]. Currently, the standard of care for the treatment of chronic pelvic/leg pain secondary to PVI is iliac vein stenting with or without ovarian vein embolization[1-3, 7, 8]. Many women receiving iliac vein stents are of child-bearing age. The effect of the gravid uterus on stent patency during and after pregnancy is currently ill-defined. The purpose of this investigation is to assess stent patency and re-intervention rates in women who have become pregnant after under- going iliac vein stenting.

Methods

We retrospectively reviewed, prospectively collected data, from our Office of the National Coordinator for Health Information Technology certified electronic medical record (Nextgen Healthcare Information Systems™, Irvine California) at the Center for Vascular

Medicine (CVM) from January 2014 to December 2020. CVM is a physician run, outpatient healthcare delivery organization that focuses on the diagnosis and management of patients with arterial and chronic venous disorders. During this time period the center was composed of 23 centers in 4 states throughout the United States. Institutional review board approval for the investigation was obtained (Integ Review IRB , Austin, Texas). Informed consent was not required as per the IRB. All women with pelvic pain and/or lower extremity pain and swelling secondary to pelvic venous insufficiency who received an iliac vein stent and subsequently became pregnant were included in this investigation. It is our protocol at CVM for all patients to receive a thorough evaluation by a Gynecologist for non-venous related causes of chronic pelvic pain (CPP). Once other causes are ruled out, a CVM venous specialist evaluates patients for the presence of pelvic venous insufficiency (PVI). All patients with a negative Gynecologic assessment for CPP, a history of pelvic pain, dyspareunia, post-coital pain, urinary frequency and/or clinical evidence of lower extremity pelvic escape veins (lower extremity veins of non-saphenous origin), were evaluated with trans-abdominal ultrasound, diagnostic venography and intra-vascular ultrasound (IVUS).

Medical/Surgical histories, presenting signs and symptoms, stent type, diameter, length, location, the presence or absence of anticoagulation during pregnancy, interval between stent placement, pregnancy and delivery, the number of pregnancies and types of reinterventions were all evaluated. All treated women underwent a diagnostic venogram which consisted of an anterior-posterior view of the bilateral iliac veins, inferior vena cava, left renal vein, left ovarian veins and any pelvic veins. Balloon occlusion venography and interrogation of the right ovarian vein was not performed. All patients had a pre and post stenting intra-vascular ultrasound for identification of an area reducing lesion of the iliac veins and confirmation of good wall

apposition and appropriate stent expansion. If a residual stenosis required post deployment venoplasty, a completion IVUS was performed to ensure proper expansion of the residual stensosis. Post-operative visits with duplex scan assessment of stent patency and function are performed one week, 3,6,12, 18, and 24 months post-operatively and yearly thereafter. For patients who become pregnant after iliac vein stenting, we recommend utilization of Lovenox throughout the pregnancy and for a month after delivery. Stent surveillance during pregnancy was not performed.

Results

From January 2014 to December 2020, 2,682 stents were placed in 2,227 patients (2046 stents in 1698 women). Of these patients, fifteen women who subsequently became pregnant seventeen times after iliac vein stenting for PVI were identified: Thirteen were pregnant once after stenting and two were pregnant twice after stenting. Table I outlines the medical and surgical co-morbidities of this cohort. The average age and BMI of the 15 women was 35.3±4.1 years and 28.9±7.8 respectively. There were 11 Caucasian and three African American and 1 Hispanic patient. There were no CEAP class 4,5 or 6 patients. Three were class zero, three class 1, one class 2 and 8 class three patients. Table II outlines pregnancy related data. The indications for stent placement were pain (n=14), swelling (10), dyspareunia (6), dysmenorrhea (9) and vulvar varices (4). The average Gravida/Para status at the time of stenting was 2.2/1.8. All deliveries were single birth pregnancies with 10 being vaginal, 5 by cesarean section, one unknown and one was still pregnant at the time of this manuscript. Numerous attempts were made to contact the last patient to determine the results of her pregnancy on stent patency without success. The average time between stent placement and delivery was 30.9 months. The

average post-partum follow-up was 43.2±24.1 months with no observed stent occlusions. Only two patients in this group had a second pregnancy after stenting. Lesions were non-thrombotic in 14/15 patients. One patient had evidence of post-phlebitic vein damage at the time of stent placement. Patients in 11 of 17 pregnancies were treated with Lovenox at the discretion of the treating obstetrician. Patients during five pregnancies had no anticoagulation at all and whether or not anticoagulation was employed in one pregnancy is unknown All patients underwent a duplex ultrasound to assess the stent after delivery. No stent related issues complicating a patient's pregnancy were reported.

Table III outlines stent specific data. Thirteen stents were Wallstents™ (Boston Scientific, Marlborogh, MA) and three were Venovo™ (Bard Medical, Covington, GA) stents. The average area reduction by intra-vascular ultrasound was 77%. The average stent diameter and length was 19.73±2.8 and 81.33±19.5 millimeters respectively. All stents except for one were in the left common iliac vein territory. Table IV outlines re-intervention data. Four of fifteen patients (27%) required stent reinterventions. Three were prior to pregnancy and one occurred one month after delivery. In the last reintervention patient, an asymptomatic proximal stent narrowing was observed after delivery during a surveillance scan. There was a proximal stenosis in a Wallstent that appeared unrelated to the patient's recent pregnancy and delivery. A stent venoplasty was performed prophylactically in this patient. The other three patients required stent extensions for recurrence of their pelvic symptoms.

Discussion

To our knowledge, there are currently only two peer reviewed publications which discuss iliac vein stenting in women who subsequently became pregnant[9, 10]. In 2009, Hartung et al reported

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six pregnant women with iliac vein stents[10]. Three were placed for non-thrombotic left common iliac vein stenoses and three were placed for symptomatic post-thrombotic lesions. Four women demonstrated duplex scan evidence of stent compression at 8 months of pregnancy. Post-partum, no evidence of compression was identified and no women required re-intervention as a result of their pregnancy. Two had pre-pregnancy re-stenting for in-stent restenoses at 20 and 37 months prior to pregnancy. All six women were treated with low molecular weight heparin starting at the beginning of the third trimester of pregnancy and terminating one month after delivery. Two women were noted to have a hypercoaguable disorder. One with factor XII deficit and one with a Protein C deficiency. In 2017, Desari et al reported their results in 12 women[9]. In this series, 11 of 12 women had a history of a deep vein thrombosis (DVT) and one had thrombolysis at 14 weeks of pregnancy for an ilio-femoral DVT secondary to a May Thurner's lesion. All women were treated with low molecular weight heparin during their pregnancies. Three women with a "history of "Factor V Leiden" were maintained on anticoagulation after delivery. Only one patient was treated with venoplasty at one year post-partum for an asymptomatic stent stenosis. One patient had two and another had three pregnancies after stenting.

Our investigation adds to the current body of literature related to pregnancy after iliac vein stenting and to our knowledge is currently the largest reported series. Unlike the two previous publications, our investigation differs in that 14 of 15 women had iliac vein stents placed for non-thrombotic iliac vein lesions. In addition, none of the women in this investigation had a known hypercoaguable disorder. Despite this fact, 11of 17 pregnancies were treated prophylactically throughout their pregnancy with Lovenox due to concerns of pregnancy related hypercoaguability. Similar to the two previous publications, three out of the four re-

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interventions in our investigation were done prior to pregnancy for Wallstent™ related inflow stenoses. A third patient presented nine years after her last pregnancy secondary to symptom recurrence from a proximal inflow stenosis of a left common iliac vein Wallstent™. This patient was treated with venoplasty and a stent extension into the left external iliac vein. The one patient who was treated with a venoplasty one month after delivery had an asymptomatic outflow stenosis that was treated prophylactically. Only two patients in this series had a second pregnancy after stenting.

Based upon these three investigations, it appears that iliac vein Wallstents™ tolerate a gravid uterus well. Given the increased radial strength of the newer Nitonol based venous stents, it can be assumed they will perform equally as well, if not better. Despite Hartung's observation that four of the six stents demonstrated compression during pregnancy, none required post-partum re-intervention[10]. In addition, the post-partum venoplasties reported by Dasari et al were both performed prophylactically for asymptomatic outflow stenoses[9]. The one post-partum symptomatic patient in our series presented nine years after her last pregnancy with an inflow stenosis unrelated to pregnancy.

A major unresolved question related to iliac vein stenting and pregnancy is in regards to the necessity of anticoagulation during and after pregnancy. The main indication for considering anticoagulation during and after pregnancy is the known increase in clotting factors during pregnancy, the increased incidence of venous thromboembolic events in pregnant women compared to non-pregnant women and the fear of medical liability[11, 12]. In women with a known hypercoaguable disorder, anticoagulation during pregnancy is reasonable as the mortality risk to the mother and unborn child of an iliac vein stent thrombosis or venous thromboembolic event likely outweighs any anticoagulation related bleeding risk. Similarly, anticoagulation in women

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with stents placed for post-thrombotic vein damage also appears prudent. However, there are no data that indicate anticoagulation in thrombotic or non-thrombotic patients improves stent patency. To the contrary, our previous publication and most recent presentation at the 2021 American Venous Forum meeting, indicates that anti-platelet agents and Factor Xa inhibitors have no effect on stent patency in non-thrombotic lesions[13]. In the two previous publications on this topic, all patients were treated with low molecular weight heparin. However, Hartung et al only started anticoagulation at the beginning of the patient's third trimester. Of the 17 patients described in the current investigation, 11 pregnancies were treated with Lovenox, five had no anticoagulation, the anticoagulation status is unknown in one and none of our patients were treated with aspirin alone. Given the safety profile of Lovenox and low dose aspirin, the increased risk of venous thrombotic events during pregnancy and the physiologic hypercoaguable state during pregnancy, the risk benefit ratio likely favors anticoagulation in pregnant women with iliac stents over no prophylaxis at all.

Limitations

The major limitation of this investigation is that it is retrospective and more than likely an under representation of the true incidence of pregnancy after iliac vein stenting. In order to identify more women who have become pregnant after iliac vein stenting, our electronic medical record system has been modified to make pregnancy related questions mandatory reporting fields. In addition, only two patients in this series had more than one pregnancy. Therefore, we are unable to assess the effect of multiple pregnancies on stent patency and function. Finally, the necessity of pregnancy and post-partum anticoagulation and the optimal anticoagulant remains unclear.

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Conclusions

Iliac vein stents in women with subsequent pregnancies demonstrate good peri and post pregnancy stent patency. Most stent re-interventions occur prior to pregnancy and pregnancy related stent complications are uncommon. In women with known hypercoaguable disorders and/or indications of post-thrombotic vein wall damage, anti-coagulation is currently the standard of care. Confirming potential benefit of anti-coagulation in pregnant women with stents for non-thrombotic lesions requires larger patient series. Given the increased risk for venous thromboembolic events, the physiologic hypercoaguability associated with pregnancy and the low bleeding risk with low molecular weight heparin use, it appears prudent to anti-coagulate all women with iliac stents regardless of the nature of the iliac lesion. If low molecular weight heparin is contra-indicated, clinicians should consider low dose Aspirin as an alternative.

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Table III: Stent Data	
Indications	
Pain	16
Swelling	10
Dysparunia	8
Dysmennorhea	10
Vulvar Varices	4
Avg time from stent to delivery (months)	31.18±18.1
Lesion type	
NIVL	14
PTS	1
Stent type	
Wallstent™	13
Venovo™	3
Avg % area reduction	77%
Avg stent diameter (mm)	19.73±2.8
Avg stent length (mm)	81.33±19.5
Number of stents placed	
1	14
2	1
Stent patency rate	100%
Stent location	
IVC-LCIV	3
IVC-LCIV-LEIV	9
LCIV-LEIV	2
LEIV- LCFV	1
IVC-RCIV-REIV	1
Overall Reintervention rate	**4/15 (27%)**
Re-intervention rate secondary to pregnancy	**1/15 (7%)**

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Table IV: Reintervention Data

Patient	Orignal indication	Indication for re-intervention	Intervention type	Reintervention secondary to pregnancy	Technical findings	Time to reintervention (Months)	1st stent location	2nd stent location	1st Diameter and Length	2nd Stent diameter and length
1	Pelvic pain	New onset left leg pain and swelling. H/o previous DVT	Stent extension	No. Interventions done prior to pregnancy.	Rokitansky lesion in LEIV and LCFV	14	IVC-LEIV	LEIV-LCFV	20x80 Wallstent™	16x90 Wallstent™
2	Pelvic pain and cramping	Recurrence of lower back pain, pelvic fullness, leg pain and swelling	Stent extension	No. Reintervention 14 months prior to preganacy and delivery	Inflow stenosis and proximal cigaring	49	LCIV	LCIV	24x45 Wallstent™	18x90 Wallstent
3	Pelvic pain, dysmennorhea, vulvar varicosities and leg pain	Asymptomatic stenosis noted on post-delivery scan	Venoplasty	No	Proximal In-flow stenosis. Delivery at 36 weeks. Placenta Previa. Venoplasty one month after delivery.	30	IVC-LCIV	N/A	22x70 Wallstent™	None
4	Pelvic pain, dysparunia, post-coital pain	Pelvic pain recurrence	Stent extension	No. Reintervention 9 years after last delivery.	Proximal In-flow stenosis	108	IVC-LCIV	LCIV-LEIV	20x70 Wallstent™	16x100 Venovo™

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Table I: Demographics	**(N=15)**	
Avg Age	35.29±4.1	
Avg BMI	28.87±7.8	
Number of pregnancies	17	
Race		
White	11	
African American	3	
Hispanic	1	
Asian	0	
Other	0	
Medical HX		
GxPx status at time of stenting	2.15/1.8	
DM	2	
HTN	0	
CAD	0	
HLD	0	
CA	1	
OA	0	
DVT	2	
Varicose Veins	5	
Surgical HX		
Endometriosis	2	
Fibroids	0	
Ovarian Cysts	0	
Ceseareans	4	
Myomectomy	0	
Endovenous procedures	6	
CEAP	**Right**	**Left**
1	3	3
2	0	1
3	7	8
4	0	0
5	0	0
6	0	0

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Table II: Pregnancy data

Indications	
Pain	14
Swelling	10
Dysparunia	6
Dysmennorhea	9
Vulvar Varices	4
Avg time from stent to delivery (months)	31.87±18.1
Gravida/Para status at stenting	2.2/1.8
Avg number of pregnancies after stenting	1.0714
Type of delivery	
Vaginal	10
C-section	3
Emergency c- section	2
currently preg	1
Unknown	1
Avg birth weight (ounces)	112.8
Anticoagulation	
ASA	0
Lovenox	11
None	5
Unknown	1
Number of babies/pregnancy	
Single	17
Twins	0
Triplets	0

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Legend to Tables

Table I: Patient Demographics. Table outlines indications for stent implantation, medical and surgical co-mormbidities and CEAP class.

Table II: Pregnancy related data. Table outlines pregnancy data related to iliac vein stenting.

Table III: Stent related data. Table outlines stent specific data related to pregnancy.

Table IV: Reintervention data. Table outlines reintervention data related to pregnancy.

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