Partial Splenic Artery Embolization for the Treatment of ITP: A Case Series-Pilot Study

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Abstract

The purpose of this pilot study was to assess the effectiveness of partial splenic artery embolization (PSE), in the treatment and management of immune thrombocytopenia (ITP). Six patients with ITP who underwent PSE were followed up. The condition was either refractory to medications like steroids, intravenous immunoglobulin, immunosuppressants, or required very high doses of these drugs which could not be tapered down. Five out of six patients did not have good response even after adding immunosuppresants to steroids. The 6 patients who underwent PSE were followed up to 7 to 18 months with an average duration of 3.5 years. A therapeutic effect was defined as a platelet count of > 10,000/cumm (level below which spontaneous bleeding is likely to occur) at the last follow-up date with marked decrease in drug dosage. A good response was seen in all the patients – their doses of drugs could be reduced considerably and all had platelet count well above 10,000 during the last follow up after PSE. None of the patients who underwent embolization had any serious complications.

Keywords
- ITP
- steroids
- immunosuppressants
- partial splenic artery embolization

Introduction

The first-line treatment of immune thrombocytopenia (ITP) usually includes corticosteroids, intravenous gamma globulin, and other immunosuppressive agents.[1] Sometimes high doses of steroid therapy may be required, and long-term use can cause potential side effects. When patients are refractory to first-line therapy, they may often require splenectomy or costly drugs like rituximab.[2] Embolization of splenic artery has been used to treat hypersplenism.[3] Later studies of partial embolization of splenic artery showed benefits over complete embolization.[4,5] The effectiveness of partial splenic artery embolization (PSE) for ITP has been reported by Ji et al[6] and Miyazaki et al.[7] Partial splenic artery embolization retains the immunogenic function of the spleen and vaccinations against capsulated microorganisms, which are given before the usual splenectomy, can be avoided.[8] However, there are not many studies in India that evaluate the efficacy of PSE in patients with ITP and hence this pilot study.

Materials and Methods

Partial splenic artery embolization was performed in the year 2016 from the month of August to November in six patients who attended the hematology clinic of our hospital.

As there are no definite guidelines till now, we formed our own guidelines which are follows:

1. Chronic ITP (> 1 year) not responding to medical treatment (high-dose steroids and immunosuppressants).
2. Platelet count < 10,000/cumm during treatment on at least four occasions (four different hospital visits with platelet count < 10,000/cumm; while during other visits the platelets were > 10000/cumm).
3. One severe life-threatening bleeding episode (those requiring platelet and red blood cell transfusion and intracranial bleeds) while on treatment.
4. Patients who cannot compromise with logistics of splenectomy (fear, scar, vaccinations) or other expensive treatment (rituximab).

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5. Unacceptable side effects of high dose of medications continued for a long time (hyperglycemia, dyselectrolytemia, weight gain, fluid retention, increased risk for infections, osteoporosis, bone marrow suppression).

Each of our patients fulfilled at least three of the above criteria. Five were females and one was male with their age ranging from 30 to 53 years with a mean age of 41 years. Five of six patients were cases of chronic ITP who were not responding to medical treatment and one of the patients had 1-month history of ITP and a PSE was done to withdraw steroids. The lowest platelet count before PSE ranged from 2,000 to 12,000 which was confirmed by checking the peripheral smear manually. All patients had taken various medications before embolization, including methyl prednisolone and other immunosuppressive drugs.

An antibiotic prophylaxis was given to all the patients with ciprofloxacin 500 mg two times for 7 days starting from the day of procedure. The procedure was done under local anesthesia. Splenic artery angiogram was performed using 4F Glide Yashiro (Terumo) catheter which showed nonenlarged spleen morphology. Multiple splenic artery branches supplying the lower pole were cannulated using Progreat microcatheter and were embolized with polyvinyl alcohol (PVA) particles of size 300 to 500 microns and Gelfoam (Ferrosan Medical Devices) (►**Fig. 1**). For most of the patients, PVA was the first choice of embolic agent. In some patients after embolization of splenic bed with PVA with slow flow in the parent artery, Gelfoam was used to further occlude the parent artery to reduce the procedure costs. End point of embolization was when contrast stasis is achieved for three cardiac cycles. Post-procedure angiogram (►**Fig. 2**) showed around 70 to 75% reduction in splenic parenchymal blush with sluggish flow in the embolized vessels. Mean proportion of spleen embolized was 60 to 75%. The mean duration of hospital stay was 6 days and then was followed up in outpatient clinic. The therapeutic effect was evaluated on the basis of platelet count at the last follow-up. A good response to the treatment was considered when there is improvement in platelet count (> 10,000/cumm) with reduction in the dosage of drugs used for treatment (steroids, immunosuppressants) (►**Table 1**).

Results

Partial splenic artery embolization brought about a good response in all six patients. All of them had an increase in platelet count and the drug dosage could be tapered down. The embolization was technically successful in all cases. The pre- and post-procedure platelet count done on days before and after the day of procedure was compared that showed an immediate rise of platelet count (►**Table 2**). No major complications were confronted. But a few minor complications did occur, such as transient fever, abdominal pain, referred pain to shoulder, vomiting and were controlled with appropriate antibiotics, analgesics, and antiemetics. Neither infections nor pleural effusions were seen. As per the Society of Interventional Radiology adverse events reporting criteria, our patients had only class B minor complications. One out of six patients had low-grade fever lasting for 3 days and subsided with antipyretics. Three of the patients had abdominal pain which subsided with analgesics and antispasmodics; two of them also had associated vomiting managed with antiemetics like ondansetron. One patient had left shoulder pain which was a referred pain and was controlled with analgesics. No minor or major complications were found in one patient.

The mean lowest platelet count of patients before procedure was 5,833/cumm (ranging from 2,000 to 12,000/cumm) and post-procedure was 26,500/cumm (ranging from 4,000 to 65,000/cumm). The average value of platelet count at the last follow-up was 84,500 (ranging from 26,000 to 1,85,000/cumm). The cost of the procedure and the hospital stay was around 100,000 rupees.

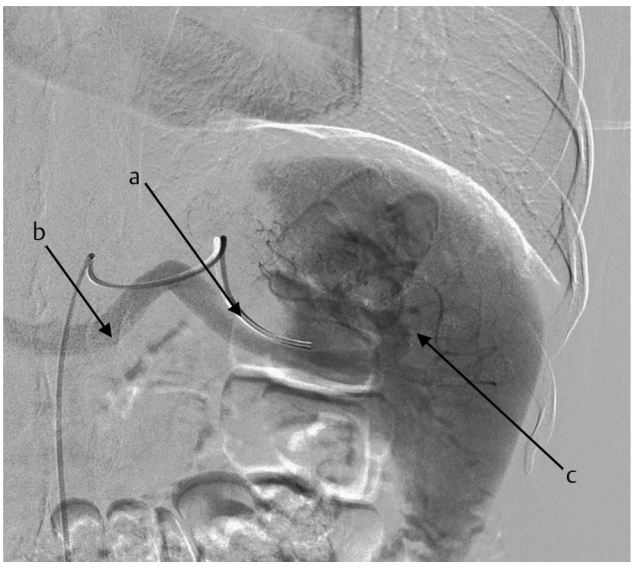

Fig. 1 Splenic artery angiogram showing splenic parenchymal blush: (**a**) Catheter in splenic artery. (**b**) Splenic vein. (**c**) Splenic blush.

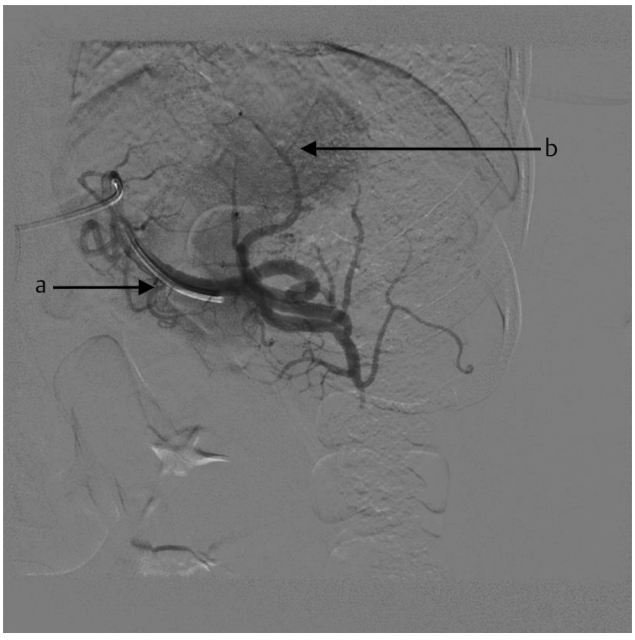

Fig. 2 Postembolization splenic angiogram showing residual splenic blush in 25% of parenchyma. (**a**) Splenic artery. (**b**) Residual splenic parenchymal blush.

Table 1 The clinical data of the patients who had undergone PSE in the year 2016 and their prognosis during follow–up

Sl. no	Age (years)	Sex	Date of diagnosis	Indications for PSE	Date of procedure	Lowest platelet count before procedure	Drugs given	Dose After PSE (mg)	% of dose reduction after PSE	Duration of follow–up after PSE	Latest platelet count (/cumm)
1.	32	F	Sep 2012	Ecchymoses, hematuria Persistent low platelet count	12–8–2016	2000	Steroids Azathioprine Dapsone	10 50	73% 0% 100%	1 year	46,000
2.	30	M	Jan 2015	Persistent low platelet count not responding to first line therapy	6–9–2016	3000	Steroids Azathioprine Dapsone MMF	6 (3/7) 50 (1/7) – –	74% 93% 100% 100%	1.5 years	74,000
3.	40	F	Aug 2016	Melaena Persistent low platelet count	13–9–2016	5000	Steroids Azathioprine Dapsone	15 100 –	37% 0% 100%	1 year	26,000
4.	42	F	Oct 2010	Gum bleeding Persistent low platelet count	21–9–2016	3000	Steroids Azathioprine Dapsone	6 (3/7) – –	89% 100% 100%	7 months	18,5000
5.	51	F	Aug 2007	Persistent low platelet count not responding to first–line therapy	6–10–2016	10000	Steroids	6	75%	1.5 years	15,0000
6.	53	F	Aug 2012	Gum bleeding, SAH Persistent low platelet count	18–11–2016	12000	Steroids Azathioprine Dapsone	6 (3/7) 50 (3/7) 100 (2/7)	78% 78% 71%	1.5 years	26,000

Abbreviation: SAH, subarachnoid hemorrhage.
(1/7)—once a week.
(2/7)—twice a week.
(3/7)—thrice a week.

Table 2 Pre– and post–procedure platelet count

Case	Pre–procedure (/cumm)	Post–procedure (/cumm)
1	1,18,000	1,30,000
2	4,000	23,000
3	6,000	8,000
4	49,000	66,000
5	95,000	10,1000
6	10,000	25,000

Discussion

Thrombocytopenia in patients with chronic ITP responds to medical therapy (steroids and immunosuppressants) variedly. Only < 40% of ITP respond to steroids.[9] Success rate of medical treatment in ITP with steroids is found to be only 20% who go into complete remission.[10] Splenectomy is the next choice, when the patient cannot be withdrawn from moderate dose of the drugs given as treatment (steroids and immunosuppresants) or does not respond to even high dose of these drugs given for a sufficiently long time. The success rate of splenectomy is 66%.[10] The spleen is a major source of platelet antibodies and lymphocyte production and it enhances the phagocytosis of white blood cells. Although splenectomy eliminates the hypersplenism that causes blood cell destruction, it increases the risk of systemic infection by capsulated microorganisms. PSE, therefore, was developed to achieve the occlusion of arteries only in certain areas of the spleen and to overcome the limitations of splenectomy.

A study done by Miyazaki et al[7] on PSE for the treatment of chronic ITP in 26 patients showed that it brought about a complete response in 33%, a partial response in 38%, and no response in 29%. No serious complications had occurred in these patients. Ji et al[6] in his study of PSE in 21 patients with chronic ITP found that the response attained 3 months after embolization with transcatheter vessel occlusion is similar to the reported results of splenectomy. In addition to the reduced morbidity and mortality associated with surgical splenectomy, the noninfarcted spleen after PSE may continue to provide immunologic functions. Splenectomy can result in serious complications like infections and venous thromboembolism.[10] Open and laparoscopic splenectomy is associated with a mortality rate of 1 and 0.2%, respectively.[11] PSE does not require general anesthesia and has not been associated with severe complications. The long-term prognosis in patients who underwent PSE was studied by Kaiho et al.[12] Of the 13 patients, 8 were followed up for 6 months. The platelet count after PSE increased more remarkably in the effective cases than in the noneffective ones ($p < 0.01$), which could predict the prognosis after PSE. One patient whose platelet count increased enough after PSE had splenectomy later and resulted in complete remission. However, another patient whose platelet count did not increase enough after PSE revealed that there was no effect even after splenectomy. So, PSE done for the treatment of ITP could sometimes predict the effectiveness of a future splenectomy. If PSE is effective, splenectomy may produce complete remission. On the other hand, if PSE is not effective subsequent, splenectomy also may not produce remission. Togasaki et al who had done a study in 91 patients with steroid resistant ITP undergoing PSE found that the complete response rate (a platelet count of > 1,00,000/cumm) was found to be 51% and overall response rate was 84% (a platelet count of > 30,000/cumm).[13] Therefore, PSE could be an alternative therapy of splenectomy because it is less invasive. The cost of PSE is likely to be less than a laproscopic splenectomy.

Conclusion

Chronic ITP has become a very common clinical challenge for physicians and hematologists. Various modalities are available for the treatment of ITP of which splenectomy is considered as the best treatment for attaining long-term remission or cure. Splenectomy is a major surgical procedure limited by logistics, costs, and fear of surgery. PSE gives us an outcome which is quite similar to splenectomy and is less invasive. Our preliminary observations from this short case series has shown that most of the patients are continuing without major bleeding and minimum medications for a long time. However, we need results from more Indian patients to make this treatment popular.

Conflict of Interest
None.

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