Treatment Of Inferior Vena Cava (IVC) and Right Innomonate Vein Occlusions With Balloon Dilatation and Rotational Angioplasty and Wallstents

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Özet: Hepatic IVC obstrüksiyonuna bağlı Budd-Chiari Sendromlu 6 hasta ve sağ innominate ven tıkanmasına bağlı SVC sendromlu bir hasta değişik tiplerdeki girişimsel radyolojik teknikler kullanılarak tedavi edildiler.

IVC tıkanması olan 6 hastanın ikisi konjental obstrüksiyon ve diğer ikisi kist hidatik kompresyonuna bağlıydı, bir olguda oklüzyon tümöre bağlı olarak gelişmişti. Son olguda ise IVC obstrüksiyonunun nedeni bilinmiyordu. SVC oklüzyonlu bir hastada ise neden postoperatif trombozdu. Olguların ikisinde rotasyonal anfjioplasti kullanılmamıştır. Dilatasyondan sonra 5 hastaya wallstent (Medinwent-Switzerland) yerleştirildi. Olguların tümünde oklüzyonlar başarı ile tedavi edilmiştir. Bir hastada IVC'daki wallstentin yer değiştirdiği gözlenmiştir.

Anahtar Kelimeler: Vena Cava, Obstruksiyon veya stenoz, Transluminal anjioplasti, Wallstent

Summary: 6 patients with Budd-Chiari syndrome due to obstruction of hepatic IVC and the patient with SVC syndrome due to occlusion of the right innominate vein were treated by using different types of radiological interventional techniques.

Of the 6 cases with IVC occlusion, two had congenital obstruction, and the other two had liver hydatid cyst compression of IVC. In one case the occlusion was due to a tumor. The last case had an IVC obstruction of unknown etiology. One patient had SVC occlusion due to postoperative thrombosis.

Rotational angioplasty was used in 2 of the cases. Balloon angioplasty was used in all of the cases. After dilatation, wallstent (Medinvent, Switzerland) was placed in 5 of the patients. In all of the cases, occlusions are treated successfully. In one patient, dislodgement of the wallstent in the IVC is observed.

Key Words: Venae Cavae, Obstruction or stenosis, Transluminal angioplasty, Wallstent.

Obstructions of IVC at the hepatic segment can cause Budd-Chiari syndrome. The prognosis of this syndrome is poor and most patients die of complications of cirrhosis and portal hypertension within several months to years of diagnosis.

Therapy has been limited mainly to palliation of complication of the illness. No intervention other than surgical membranotomy in a very limited number of the patients has been available to correct the underlying pathophysiologic abnormality. Moreover, even with a conservative by-pass operation, the mortality rate can be as high as % 40 (1).

Recently, interventional radiological techniques are being used in these patients and the patients with SVC obstruction (1-15).

In our department, we use these techniques in

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6 patients with IVC obstruction causing Budd-Chiari syndrome and in one case with right innominate vein obstruction causing SVC syndrome.

METHODS

In Radiology department of T.Y.I.H. between March 1990-August 1991 six cases with IVC obstructions causing Budd-Chiari syndrome and one case with right innominate vein obstruction causing SVC syndrome were treated by using interventional radiologic techniques.

The patient group included 3 men and 4 women the ages of whom ranged from 20 to 62 with an average age of 41 years.

Two of the cases with IVC obstruction, etiology thought to be congenital. Of these, one had complete membraneous obstruction and other had segmental constriction. In other two cases, there were operated liver hydatid cyst compression of hepatic IVC and one case had a liver mass which caused the obstruction of the hepatic IVC. In the last case with hepatic IVC stricture the etiology was unknown.

The case with SVC obstruction had a previous cardiac surgery and reoperated for the complication of SVC obstruction. In this patient there was an obstructed segment at the right innominate vein.

In 5 patients inferior vena cavagrams were obtained via right femoral vein. Left femoral vein also catheterized during procedure to localize the obstructed segment by injecting contrast material. In one patient cavagram was performed via right subclavian vein because there was an obstruction at the level of iliac veins on both sides. In the case with SVC syndrome, venography was performed via right axillary vein and during the procedure left brachial vein also catheterized with the same purpose.

In the patients with complete membranous obstruction we use the ROTACS catheter rotating with a 200 Rpm speed. While the catheter was rotating we pushed the stiff end of a guidewire through ROTACS catheter and punctured the membrane.

Other cases with IVC obstruction had incomplete obstruction, so guidewires could be passed through the obstructed segment.

We used 3x10 mm triple balloon angioplasty catheter in 2 cases(Case 1 and 6) and various sizes of 8-10 mm angioplasty catheters in the other cases.

Wallstents were used in four of the cases with IVC obstruction and in the case with SVC syndrome. Sizes of the wallstent were 10x50 mm, 16x100mm, 16x125 mm and 10x100 mm. In 2 of the cases double wallstents were placed (Case 5 and 7).

5000-10000 Unite Heparine were given all the patients, during the procedure and 375 mg Aspirin daily after the procedure.

RESULTS

A summary of the information about the patients and results is presented in Table 1.

First case with complete membranous obstruction was treated successfully using ROTACS angioplasty and balloon angioplasty with a 3x10 mm triple balloon angioplasty catheter. Pressure gradient between IVC and the right atrium which was 14mm preoperatively decreased to 3 mm Hg. Control cavagraphies which were obtained 6 and 17 months later showed patency of the IVC. Pressure gradient was 3 mm Hg and clinical symptoms were also improved. In the second case with a congenital segmental narrowing of hepatic IVC, due to use of balloon angioplasty with a 8mm balloon catheter, pressure gradient decreased from 14 to 7mm Hg. Two months later control cavagraphy was obtained. Pressure gradient

Table I.

PATIENT AGE/SEX	SITE	TYPE OF LESION	INTERVENTIONAL METHOD	GRADIENT BEFORE/AFTER mm Hg	TOTAL FOLLOW UP
1/23 M	IVC	Complete membraneous obstruction	ROTACS+Balloon dilatation	14/3	17 Months
2/24 F	IVC	Segmental narrowing	Balloon angioplasty	14/7	16 Months
3/62 F	IVC	Complete Obs. Hydatic cyst.	Balloon angioplasty Wallstent (Medinvent Switzerland)	10/4	10 Months
4/52 F	IVC	Complete Obs. Hydatic cyst.	Balloon angioplasty Wallstent (Medinvent Switzerland)	12/3	16 Months
5/20 F	IVC	Complete Obs. Tumor infiltration	Balloon angioplasty Wallstent (Medinvent Switzerland)	10/8	12 Days
6/35 M	IVC	Segmental narrowing Unknown etiology	Balloon angioplasty Wallstent (Medinvent Switzerland)	10/3	15 Days
7/52 M	SVC	Obstruction (Post-operative complication	ROTACS angioplasty Balloon angioplasty Wallstent (Medinvent Switzerland)		10 Months

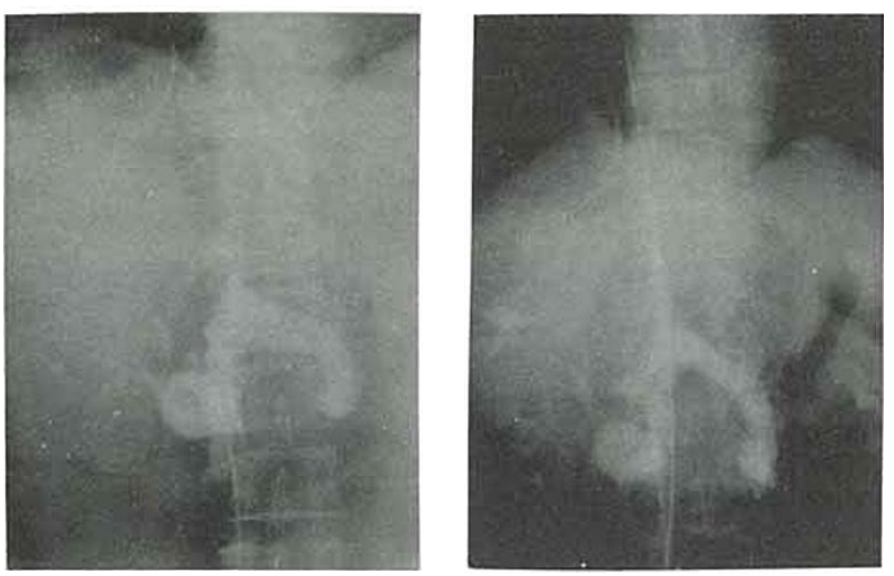
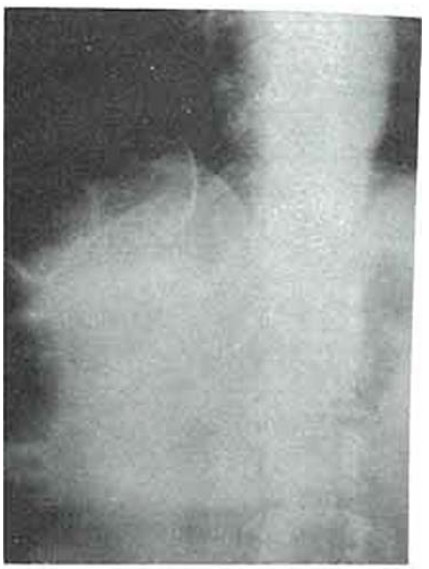
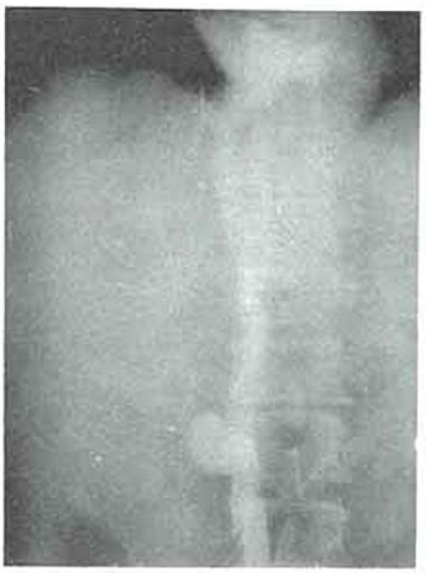


Fig. 1 a,d. IVC obstruction due to operated hydatid cyst.

a. Cavagraphy showing a tapered constriction of the IVC just above the left renal vein
b. Balloon angioplasty were performed at the obstructed segment.

was 12mm Hg. Then balloon angioplasty was performed again. 16 months later cavagraphy revealed patency of the IVC. Pressure gradient was 6 mm Hg and no clinical symptoms were present. In two cases with hepatic IVC obstruction due to operated liver hydatid cyst, balloon dilatation was inefficient and wallstents were placed at the obstructed segments (Fig. 1a, b). In the former case the placed wallstent (Fig. 1c) was 10x150 mm and control ca-



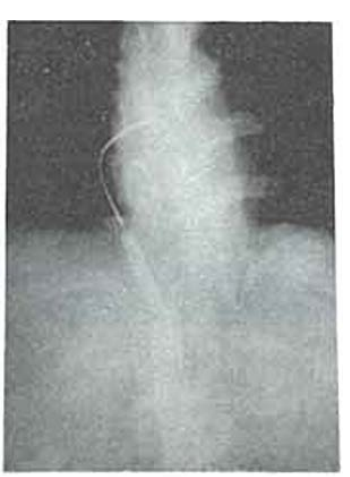


c. Wallstent was placed.

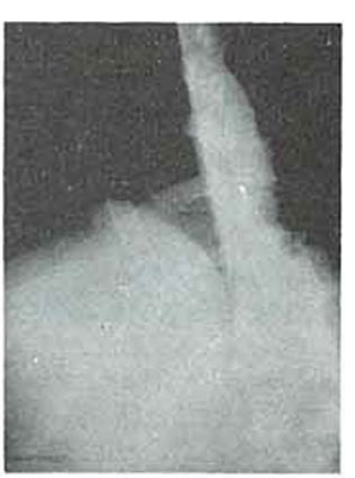
d. Control cavagram showed patency of IVC and stent.

vagram revealed patency of the IVC and stent (Fig. 1d). Pressure gradient between IVC and right atrium was 4 mm Hg. Ten months later angiography showed patency of the IVC and stent and clinical symptoms also improved. In the later case who had 3 unsuccessful balloon angioplasty in 6 months, we used a wallstent. (10x50 mm). Hiccup developed in the patient as a complication of the procedure. We decided that this complication appeared as a result of the irritation of branches of phrenic nerve around the IVC orifice at the diaphragm. On the next day stent migrated into the right ventricle. We believe that the unexpected complication of hiccup caused the migration of the wallstent. Wallstent was extracted from right ventricle surgically. No complication was observed postoperatively. Because of high morbidity and mortality of surgical dilatation of this stricture, we are planning to place a wider wallstent in this patient in the future. Case 5 had a long constriction of hepatic IVC, so a wallstent of 16x125mm size was placed after balloon angioplasty (Fig. 2a, b, c).

2 a



2 b



2 c

Fig 2 a,c. Case with IVC obstruction due to tumor infiltration.
a. Cavagraphy revealed complete obstruction at the hepatic IVC.
b. Balloon angioplasty was performed.
c. Wallstent was placed

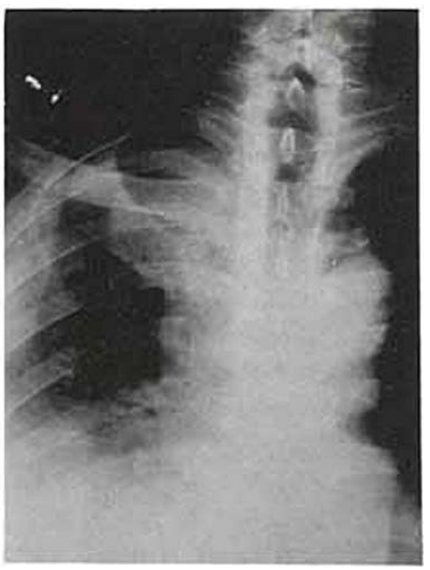


Fig 3. A case with SVC syndrome. Placed Wallstents.

But despite the stent, the constricted segment persisted. Balloon dilatation was performed within the stent but turned to be unsuccessful. Another wallstent of same size was placed at this site through the previous one. Control cavagraphy showed free flow to the right atrium. But a defective image at the right atrium was seen. Echocardiography also showed a mass within the right atrium. The mass extracted surgically and the stent was sutured to the wall of the IVC wall. The histological examination of the mass showed that it is rhabdomyoma. Case 6 had a narrowing segment of IVC below the diaphragm. This segment was dilated by simultaneously inflating 3x10 mm triple balloon angioplasty catheter but dilatation was unsuccessful. A wallstent of 16x100mm was placed. After placement of wallstent cavagraphy showed a good flow but the patient died 15 days later due to his advanced primary disease.

In the case with SVC syndrome, there was an obstruction at the right innominate vein. Obstructed segment was canalized with a ROTACS catheter via right basilic vein. Balloon angioplasty was performed with a 10 mm balloon angioplasty catheter. The wallstent of 10x100 mm size was placed. Control venography showed patency of the stent. But venography performed a week later showed the occlusion of the stent. A guidewire was passed through the stent to the right atrium and balloon dilatation was performed within the stent. Then another wallstent of same size was placed into the previous one (Fig. 3). 10 months later patient was free of symptoms.

DISCUSSION

In segmental or membraneous obstructions of hepatic IVC causing Budd-Chiari syndrome surgical treatment has high morbidity and mortality. For this reason interventional radiologic techniques are being used in these patients as an alternative method to surgery. In the literature there are few cases that were treated by balloon angioplasty (1-9). When balloon angioplasty was inefficient, some investigators used metallic stents in these patients as a new dimention in this field of therapy. Some investigators also used these stents in cases with IVC obstruction due to hepatoma compression (10).

We used ROTACS angioplasty in a patient with a complete membraneous obstruction of hepatic IVC. This case and the other with congenital segmental obstruction were treated successfully and they were followed during the next 16 months without any clinical symptoms.

In treatment of cases with hydatid cyst compression of hepatic IVC we placed wallstent followed by balloon angioplasty and this was the first time in the literature. In the case with IVC obstruction due to liver tumor, wallstent was placed successfully. The condition of the patient was good but nothing can be thought about prognosis because follow-up duration was short. In the case with IVC obstruction of unknown etiology wallstent was also placed successfully but the patient died in two weeks due to his advanced primary disease.

Our results show that balloon angioplasty may be efficient in cases with congenital IVC obstructions. But if the obstruction is due to a compression of a mass, balloon angioplasty is not sufficient by itself and should be supported by the addition of a wallstent.

Superior Vena Cava syndrome is caused by mechanical obstruction of SVC and often due to malignant growth and open heart surgery (11-15). In the literature balloon angioplasty was used in postoperative cases and temporary relief was obtained (11.14). Some investigators used metallic stents in cases of SVC obstruction due to malignant etiology and achieved good results (13.15).

Our case of SVC syndrome had a right innominate vein obstruction as a long term complication of coronary bypass operation. Our treatment by using the wallstent was successful in this patient and he was symptom free during ten months follow-up. We believe that further studies will clarify the long term success of these interventional techniques.

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