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Case Report

Management of Hepatic Venous Outlet Obstruction with Placement of Bakri Balloon

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Keywords

- Hepatic venous outflow obstruction
- Liver transplant
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Abstract

Hepatic Venous outflow obstruction can rarely but significantly occur following the 'piggy back' technique of vena caval reconstruction. There are various mechanisms that cause hepatic venous outflow obstruction. A 'ball valve' type of obstruction requires the liver to be elevated. This can be achieved by placing various devices under the liver. We present our experience of using the 'Bakri tube', a single bulb device designed for control of intra uterine bleeding, to elevate the liver and relieve hepatic venous outflow obstruction.

ABBREVIATIONS

INR-International Normalised Ratio; LFTs-Liver Function Tests; IVC-Inferior Vena Cava; HVOO-Hepatic Venous Outflow Obstruction; ITU-Intensive Therapy Unit; US-Ultrasound

INTRODUCTION

Tzakis et al; in 1989; popularised the 'Piggy back technique' which retained the native IVC and consequently avoided the problems associated with cross clamping [1]. The piggy back technique is credited with a shorter operating time; shorter an-hepatic phase; shorter warm ischemia time and a reduction of blood loss [2,3]. Since the blood flow to the heart is preserved during the procedure; haemodynamics are kept stable and kidney function is well preserved. Hepatic venous outflow obstruction has been reported (2.5%) both intra operatively presenting as congestion and in the post-operative period presenting with ascites [4]. We report an interesting experience in treating this complication with a 'Bakri Balloon' and suggest it as a novel tool in the armamentarium of a liver surgeon.

CASE PRESENTATION

A 28 year old lady presented with four days history of nausea; vomiting; jaundice & deranged LFTs with no history of substance abuse and a negative toxicology screen. She subsequently developed altered sensorium and hypotension and was transferred to our transplant centre for management of acute liver failure and consideration for liver transplantation. On admission the INR was 10.4; ammonia levels were elevated at 167umols/L and hepatitis screen was negative. She underwent a liver transplantation with the caval anastomosis being done in a side to side piggy back fashion.

On the 2nd post-operative day in the ITU; she had intra-abdominal bleeding confirmed by Ultrasound scan which showed a large haematoma behind the right lobe of liver and haemoperitoneum (Figure 1). She was re-explored and found to have a large haematoma behind right lobe of liver with compression of IVC &congestion of the liver. Two small bleeding points at the right lateral aspect of the IVC and in the right triangular ligament were sutured. After evacuation of the haematoma; lowering of the liver in the bed resulted in a drop in CVP and blood pressure. Therefore the liver was elevated with a 435 ml breast implant (Allergan BANK) and a pack. Following the elevation the liver remained adequately drained and the CVP and blood pressure remained stable.

On 5th post- operative day from the index transplantation the

Figure 1 Doppler scan with liver lying 'Flat'. No phasic flow was seen.

breast implant and pack were removed. The same syndrome of dropping blood pressure & CVP was seen on lowering the liver into the bed. A 'Bakri' balloon device (Cook Medical) (used for control of post-partum uterine haemorrhage) was inserted and its bulb inflated to 400 mls. The liver remained adequately drained with no haemodynamic instability. The post inflation Doppler showed good flow in the hepatic veins. The abdomen was closed using a porcine dermis; 'Strattice' mesh (Life Cell) with the 'Bakri' tube being brought out percutaneously (Figure 2).

The patient progressed well and was discharged from ITU on 11th post- operative day (Figure 3). The balloon was deflated by 50 ml on the 31st post- operative day and the patient was discharged home (Figure 4). Subsequent balloon deflation was done on weekly basis in the clinic with regular Doppler monitoring. The balloon was removed under local anaesthesia on 60th post-operative day without any issues (Figure 5). A trans- jugular biopsy on the 80th post-operative day revealed no evidence of venous obstruction with equal hepatic vein and IVC pressures of 8 cm of water (Figure 6). There was no gradient and no evidence of obstruction. On a follow up of 30 months she has no evidence of Hepatic Venous Outflow Obstruction.

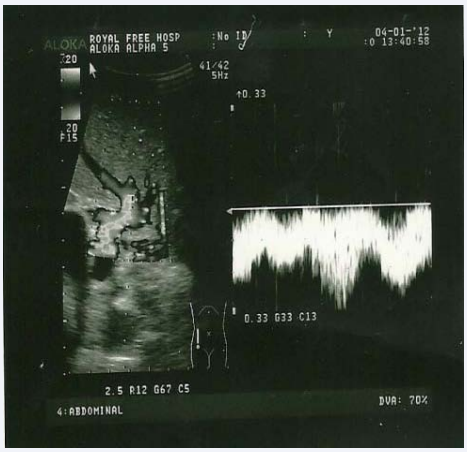

Figure 2 US doppler scan with liver elevated. Good phasic flow demonstrated.

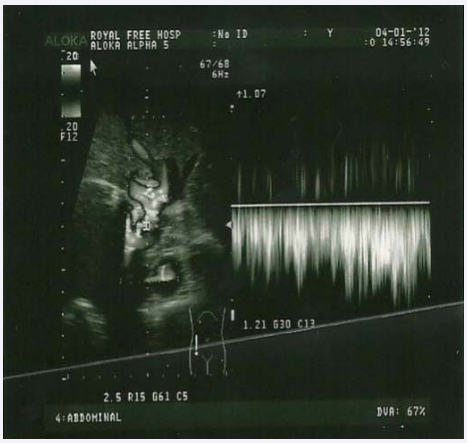

Figure 3 US Doppler tracings with 'Bakri' balloon in place.

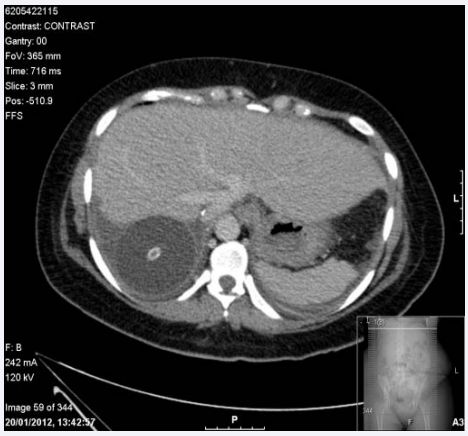

Figure 4 Post op venous phase CT with inflated 'Bakri' balloon showing good patent hepatic veins and IVC.

Figure 5 Completely deflated bulb of 'Bakri' balloon.

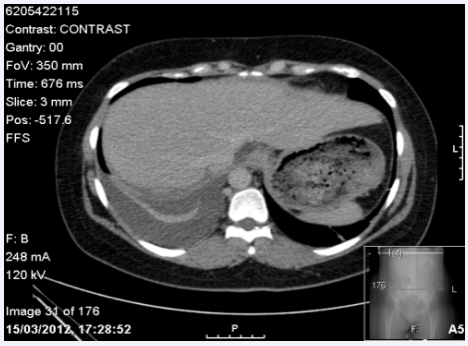

Figure 6 Balloon removed, 'fixed position' of liver with complete patency of veins.

DISCUSSION

Developments in the piggy back technique

The classic 'Piggy back' technique as proposed by Tzakis et al involved anastomosing the out flow from the donor hepatic veins to a common cuff of the left and middle veins of the recipient after tying off the right vein. With this method some authors reported intraoperative venous congestion problems due to compression of the anastomosis by the liver in a ball valve

fashion and malrotation of the graft due to discordance in the size of the graft and recipient hepatic bed. According to Pascual et al these were seen in up to 2.5% cases and 5% cases respectively. To overcome the problems of the 'classical PB technique' Belghiti et al developed a side to side anastomosis technique in which both ends of the IVC were tied and the anastomosis was created between the posterior surface of the donor IVC and anterior surface of the recipient IVC [5]. Venous outflow obstruction in the side to side cavo-cavostomy has been reported in up to 5.5 % cases as described byHesse et al [6].

The technique of end to side cavo-cavostomy was described by Cherqui et al. It entails anastomosis of the superior end of the donor IVC after extending the orifice by an extension on the posterior surface of the IVC. This is then anastomosed to the anterior surface of the recipient IVC after side clamping just one third of its circumference [7].

Mechanisms for hepatic venous outflow obstruction in piggy back technique

The two common mechanisms of outflow obstruction are:

- The 'ball valve' mechanism of the liver in the classic technique blocking the venous anastomosis

- The discordance in the grafts size versus the recipient hepatic bed causing a malrotation and obstruction of the hepatic venous outflow [8].

A genuine fibrotic stenosis of the anastomosis can occur which is differentiated from an elastic stenosis. The elastic stenosis is usually due to malposition or kinking and can be differentiated probably only on balloon angioplasty [9].

A long suprahepatic IVC segment might result in an 'accordion like effect' causing a vena caval obstruction [10].

Diagnostic confirmation of hepatic venous outflow obstruction

The confirmation of outflow obstruction would depend on the time of manifestation i.e. whether intra operative or post-operative

The intra operative manifestation is congestion seen in the immediate post perfusion period and can also present as haemodynamic instability as seen in our experience. The cause is usually a rotation and out flow obstruction [11].

The post-operative manifestation of hepatic venous outflow obstruction (HVOO) is most often massive ascites refractory to diuretic therapy. This is seen in up to 7% of patients receiving a full size graft [12].

The use of US Doppler can accurately identify all cases of outflow obstruction. The pressure gradient threshold for identification of HVOO has been variously described to be between 5; 7 & 10 mmHg. However Venography and measurement of pressures remains the gold standard to confirm the diagnosis of HVOO [13].

Treatment options of hepatic venous outflow obstruction

The treatment options depend on the mechanism; for genuine stenosis- either elastic or fibrotic; the options are balloon angioplasty or stent placements. The use of balloon angioplasty; though used to distinguish elastic versus fibrotic stenosis; is not usually used for fear of anastomosis disruption in the early post-operative period. Surgical correction is technically demanding and associated with discouraging results. As such a cautious approach needs to be adopted.

For obstruction due to malposition of the graft there are various options available. In case of mismatch between the recipient hepatic fossa and the donor graft; the hepatic fossa can be reduced by suturing the peritoneum covering the right kidney to avoid graft malposition [8].Use of Breast implants to correct malrotation and out flow obstruction have been reported for both intra operative and two staged post-operative management [13,14]. Balloons or tissue expanders have been used but have the disadvantage of being temporary and have the potential of external contamination due to repeated handling [13]. Sengstaken-Blakemore device has been used to correct outflow obstruction intra operatively in liver transplantation [10].

Of the various techniques discussed above we chose insertion of the 'Bakri' balloon as it is a single bulb device which could be easily removed through the percutaneous exit point in the skin. We decided to remove the silicone breast implant during removal of the pack. Reduction of the hepatic fossa by suturing the peritoneum to gerota's fascia was not undertaken as the mechanism of outflow in our situation was not 'rotational' but more of the 'ball valve' kind; requiring elevation. As opposed to Steinbruck and colleagues who reported removal of the Sengstaken-Blakemore in the early post-operative period [11]; we adopted a slow deflation policy. It is noteworthy that Gastaca and colleagues who inserted a breast implant as a second procedure stated that there were very few adhesions around the liver in their experience and ascribed this to the presence of ascites [13]. We therefore adopted a slow deflation policy as mentioned to allow the ascites to subside and for the adhesions to form sufficiently to fix the liver in the desirable position. This technique worked very well. The patient at the 80th post op day and on 30 month follow up had no pressure gradient between the hepatic veins and the IVC indicating no outflow obstruction. We suggest this as a useful tool in this situation.

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