

Transjugular intrahepatic portosystemic shunt: Nursing approach

Helen Dokoutsidou,¹ Alexandros Kantianis²

1. RN, MSc, PhD(c), Nurse of Infection Control Department, “Evangelismos” Hospital, Athens, Greece
2. RN, MSc, PhD(c), Athens, Greece, Staff Training Manager, “Biomedicine”, Athens, Greece

Abstract

Introduction: Transjugular intrahepatic portosystemic shunt (TIPS) is a valuable alternative to surgery in patients with acute or recurrent variceal bleeding. Variceal bleeding is a serious, life-threatening condition rendering the particular treatment essential for the survival of the patient.

Aim: To show how important the role of the nurse is during the placement of the TIPS based on recent international bibliography.

Material - method: For the research elaboration both Greek and international bibliographies have been reviewed, particularly emphasising on Medline indexed nursing articles.

Results: The results of the present review showed that bleeding due to oesophageal varices is a serious and often fatal complication of portal hypertension in patients with hepatic cirrhosis. Currently available treatments include various procedures such as balloon tamponade, endoscopic and surgical interventions, and radiological interventional techniques (TIPS). The most important indication for the placement of the TIPS is the treatment of acute variceal bleeding and / or the prevention of recurrence in patients not responding to standard endoscopic therapy and medical treatment and their general condition does not allow surgical treatment. According to the literature, is the ideal solution for patients with hepatic disease at an advanced stage that is scheduled for liver transplantation, when there is no alteration in the intraabdominal anatomic elements and the way they are related.

Conclusions: It is important for the nursing staff to be familiar with this newly developed technique. The well-trained and well-informed nurse can play an essential role in evaluating the clinical course of the patient before, during and after the procedure, and in recognizing whether the therapy objectives have been achieved or not.

Keywords: esophageal varices, variceal bleeding, stent, transjugular intrahepatic portosystemic shunt

Corresponding author:

Helen Dokoutsidou
66-68 Astidamandos Street, GR- 11634 Athens
Tel. +30 210-7250459, +30 6937709015
E-mail: ldokout@gmail.com

Introduction

Transjugular intrahepatic portosystemic shunt (TIPS) or else transjugular intrahepatic portosystemic stent-shunt (TIPSS) is a radiological interventional technique used for the treatment of complications of portal hypertension and is recommended for the percutaneous creation of an intrahepatic anastomosis by placing a stent between the main intrahepatic branch of portal vein and a hepatic vein, so that a part of portal flow is diverted directly into the systemic circulation and the portal system is decompressed.^{1,2}

Initial efforts to create intrahepatic portosystemic shunt in rats and subsequently in humans did not yield the expected results, because the communication between the hepatic and portal veins had poor patency. The most significant progress was made in 1985 with the introduction of a special intravascular metal stent in rats, while a few years later in 1989, Palmaz and Richter used an expandable endoprosthesis in humans which maintained shunt patency and allowed the introduction of a metal tube between an endohepatic branch of the portal vein and a branch of the hepatic vein. This led to the broad acceptance of TIPS in 1990, and since then the method has clinically been used worldwide due to its effectiveness, in the reduction of portal hypertension, at least in the short-term.^{3,4}

Indications and contraindications for TIPS

The most important indication for TIPS placement is the treatment of acute variceal bleeding and / or prevention of its recurrence in patients not responding to standard endoscopic therapy and medical treatment, when their general condition does not allow surgical treatment. It seems to be the ideal temporary solution for patients with liver disease at an advanced stage that have been scheduled for liver transplantation, since there are no alterations in intraabdominal anatomic elements and the way they are related.

Various studies demonstrate the usefulness of this method in the treatment of gastric or intestinal varices, portal hypertensive gastropathy, medication-resistant ascites, hepatic hydrothorax, hepatorenal syndrome and Budd-Chiari syndrome, all of which are due to portal hypertension.¹⁻⁴

The effectiveness of TIPS reaches up to 100% in specialized centres and is associated with the interventional radiologist's technical skills. Stopping and / or preventing bleeding is achieved in 73-96% of the patients. The mortality attributed to the placement of TIPS is less than 1%. The placement of TIPS causes a considerable lowering of the pressure in the portal system, which can reach up to 50%, resulting in great reduction of bleeding, as well as the size of varices, and improvement of ascites and functional renal failure in patients with variceal bleeding. TIPS reduces the possibility of recurrence of bleeding in the first twelve months, when compared with sclerotherapy; on the other hand, a high rate of patients develop hepatic encephalopathy de novo after placement of TIPS.^{5,7}

The placement of TIPS is contraindicated in patients with severe hepatic failure, since the induced reduction of blood flow in the liver may further worsen liver function. Just like surgical portosystemic shunts, TIPS is also accompanied by the elevation of right heart pressure, and therefore should not be performed in patients with diagnosed right-sided heart failure, elevated central venous pressure or portopulmonary hypertension.⁸⁻¹⁰

Moreover, existing severe hepatic encephalopathy, polycystic kidney disease, presence of an active intrahepatic or systemic infection, and primary or metastatic liver neoplasms are definite contraindications for the placement of TIPS. Rarer contraindications are hepatic artery stenosis, occlusion of the inferior vena cava or portal vein, and polycystic liver, since rupture of cysts can be caused in the latter, followed by rapid and extensive bleeding.⁸⁻¹⁰

Possible advantages of TIPS, when compared with surgical portosystemic shunts, are reduced short-term morbidity and mortality rates, especially in people with deficient hepatocellular function. TIPS improve the quality of life of cirrhotic patients, since it minimizes the duration of hospitalization, as well as extensive medical practice (abdominal paracentesis, endoscopy, etc.).¹⁻⁴ On the other hand, the high rates of encephalopathy, the high cost, the frequent monitoring of the patient to ensure shunt patency, as well as the fact that long-term survival of patients is not improved, are all parameters that should always be seriously taken into consideration.⁸⁻¹⁰

TIPS procedure

The placement of TIPS is a difficult technique and is performed in specialized radiological centres. The procedure is performed while the patient is under sedation with local anaesthesia. The portal vein division is localized with the use of Doppler ultrasound. The middle hepatic vein is catheterized through the jugular vein (puncturing the right internal jugular vein) and through the catheter a needle is inserted into a branch of the trunk of portal vein. Through this needle a guide wire is inserted and the catheter is advanced under ultrasound guidance to the intrahepatic branch of the portal vein. The needle is then removed and the difference in pressure between the portal vein and the inferior vena cava is measured. The lumen opened up by the needle is balloon-dilated and the angiography is performed. There follows the insertion of an expandable balloon-dilated metal stent of the Palmaz type or a self-expanding and more flexible metal stent of the Wallstent type, either of which is dilated until its gauge reaches 8-12mm between the hepatic and the portal veins.¹⁻⁴ The gauge of stent is adjusted so as to reduce pressure in the portal vein in order to be less than 12 mmHg. If portal hypertension persists, a second stent may be deployed alongside the first. The contribution of ultrasound is

imperative at all stages of the procedure. The procedure may take 1-2 hours to complete. Then, the patient is taken to the Intensive Care Unit for 12 to 24 hours for management. Doppler ultrasound is performed one day after the TIPS placement so as to evaluate the stent maintenance.¹¹⁻¹³

Complications of TIPS

The TIPS method presents technical difficulties in its implementation, with unexpected complications. The mortality rate is less than 1% and a 30 day survival reaches 85%. Complications occur in approximately 10% of the patients.⁴

Complications of TIPS concern:

1) Its placement. Hematoma in the area of the neck, pneumothorax, hemoperitoneum and hemochoelia are possible to result. The hematoma in the neck and pneumothorax are due to puncturing the right internal jugular vein. The hemoperitoneum results from puncturing the liver capsule, whereas accidental puncturing the biliary tree results in hemochoelia. However, these complications have dramatically been reduced due to better training of interventional radiologists.¹⁻⁴

2) Constriction and occlusion of the stent. The main problem of TIPS is gradual reduction of the gauge of the stent resulting in occlusion at a rate of 31-71% of the patients during the first year following the procedure, and at a rate of 31-47% of the patients during the second year, which is due to accumulation of platelets, creation of a clot and / or inflammation or stenosis of the hepatic vein because of the rapid blood flow and localized production of growth factors. The low pressure between portal and hepatic veins favours occlusion. Monitoring of the patient with the use of Doppler ultrasound is imperative in order to ensure shunt patency post-interventionally and has to be carried out every 3 months for the first year and every 3-6 months thereafter. When there is well-grounded suspicion of TIPS occlusion there is required hepatic vein catheterization and angiography. Post-TIPS angiography is recommended on the 6th and

12th month following the procedure and then once annually for the next years.¹⁻⁴

Early shunt occlusion is observed in 1-15% of the patients, due to localized thrombosis during the first 30 days following the procedure, and is associated with technical problems during the introduction of the stent. Precautionary use of heparin, only when coagulation permits, may reduce the risk. The thrombosis can be treated with localized dilators, replacement of the stent or localized fibrinolytic therapy. Progressive constriction of the gauge of the stent leads to recurrence of portal hypertension and often to bleeding recurrence in 15-30% of the patients. In such cases, anticoagulant and / or fibrinolytic treatment do not help and the stent must be replaced or dilated. Subsequently, the prognosis is good, with the patency of the stent remaining in a good state, for the rest 80-90% of the patients during the first two years following the procedure. TIPS patency may be maintained in the long-term with the administration of antithrombotics, such as ticlopidine, alone or in combination. The occlusion of the stent is more frequent in patients with Child class C cirrhosis.¹¹⁻¹³

3) The long-term maintenance of stent. Such complications include haemolysis, migration of the stent, infections, heart and renal failure and portopulmonary hypertension, the frequency of which depends on the severity of hepatic failure (Child-Pugh class):

- Endovascular haemolysis may result from damage of erythrocytes due to the steel mesh of the stent.
- Migration of the stent towards the right hepatic artery causes liver infarct and can only be removed with the use of loop.
- Infections are common and usually fatal. Antibiotics should be administered cautiously.
- Congestive heart failure occurs in patients with underlying heart disease, because the hyper dynamic circulation in cirrhosis is deteriorated due to the placement of the stent since there is an increase in cardiac output and blood volume within the systemic circulation.

- Renal failure occurs in patients with impaired renal function and is due to the injection of large quantities of contrast material.
- Portopulmonary hypertension is referred to as bending of the right ventricle in patients with portal hypertension. It is attributed to extensive vasoconstriction in pulmonary arterial circulation.¹¹⁻¹³

4) Deterioration of the liver function and development of hepatic encephalopathy. The portosystemic encephalopathy is a severe complication following TIPS placement, which occurs in 20% -30% of the patients and is associated with the patient's age (over 60 years), stage of cirrhosis according to Child's classification, the gauge of the stent, alcoholic hepatic disease and previous history of encephalopathy. The hepatic encephalopathy is due to failure of hepatocytes (5-10%) to inactivate substances (nitrogenous or toxic) that have a toxic action on the central nervous system, as well as the existence of the portosystemic shunt itself, allowing direct entry of these substances into the systemic circulation, bypassing the liver.¹⁻⁴ As TIPS is a side-to-side portosystemic shunt, it is not surprising the fact that post-TIPS encephalopathy occurs at a rate of 25-30%, the same one with post-operatively created portal-caval anastomoses. The prognosis is worse when this complication occurs during the first month. It can be treated successfully with the placement of a stent with narrower gauge within the intrahepatic shunt, as well as the reduction of protein consumption in the patient's diet and the administration of medicines such as lactulose and neomycin. Persistent encephalopathy is highly considered as an indication for future liver transplantation.¹¹⁻¹³

TIPS procedure: a nursing approach

For the successful placement of TIPS, it is important that the nursing staff be familiar with this newly developed technique, because of the increasingly growing number of patients with variceal bleeding resisting sclerotherapy or ligation.

The well-trained and well-informed nurse can play an essential role in evaluating the clinical course of the patient before, during and after the procedure, as well as assessing whether the therapy objectives have been achieved or not. In this way the nurse not only facilitates, but also contributes to the planning of nursing care of the patients throughout their hospitalization.⁴

For patients who are to undergo this invasive radiologic technique, nursing tasks could be divided into three stages:

- Preparation of the patient for TIPS placement
- Procedure of TIPS placement
- Post operative monitoring of the patient and follow-up instructions

a. Preparation of the patient for TIPS placement:

In the context of the patient's preparation for TIPS placement, his/her psychological and emotional support will enhance the sense of safety and stress reduction. Furthermore, it is within the nurse's purview to support the patient's personal control by informing him/her about the procedure of stent placement in simple and understandable words. Within the scope of information, all expected benefits and possible complications of this procedure are thoroughly explained and then written consent is obtained. It is essential that sufficient time be ensured, so that any patient's queries and misconceptions are clearly explained. The need of placement of central venous line for the catheterization of the right internal jugular vein, as well as a Foley catheter for urine drainage throughout the procedure must also be communicated to the patient. Last but not least, the information provided includes the patient's need for hospitalization for 3 to 5 days, depending on the clinical course. ECG should be conducted to all patients over 60 years of age and to those with a history of diabetes, heart disease or alcoholism, to confirm that the heart can «survive» the increased volume of blood diverted into the systemic circulation resulting from the creation of anastomosis. Continuous and effective

monitoring for clinical signs of hemodynamic compromise must be maintained at all times to determine the need for blood loss replacement. Before the beginning of the procedure of stent placement, it is necessary to administer tranquilizers, such as diazepam and midazolam, or even narcotic analgesics such as meperidine. It is rarely required to administer anti-stress medical treatment several hours before the procedure. However, administration of antibiotics 24 hours prior to surgery is strongly recommended, in order to prevent infections.¹⁴⁻¹⁸

b. Procedure of TIPS placement:

The whole procedure takes place in the Department of Radiology while the patient is under sedation, administered by a specially trained nurse. Throughout the procedure the specially trained nurse is responsible for monitoring the patient's vital signs and his/her level of consciousness. In some centres general anaesthesia is preferred, not only because it allows the anaesthesiologist to have full control of the patient's breathing throughout this critical procedure, but also minimizes the degree of discomfort; additionally, it raises the rates of the successful accomplishment of the procedure. The specially trained nurse is also responsible for supporting the radiologist by providing him/her with the materials and equipment required during the stent placement, while applying aseptic technique. 1 to 5 hours are required for the procedure to be completed. During the procedure the patient has to be closely monitored so that his/her vital signs and oxygen saturation are recorded every 5 minutes.¹⁴⁻¹⁸

c. Post operative monitoring of the patient and follow-up instructions

After the successful stent placement the patient is taken to the resuscitation unit for further monitoring of his/her clinical status and checking for any signs and symptoms of bleeding, which may have resulted from accidental puncture of the liver capsule during the procedure. The specially trained nurse should immediately notify the

attending physician if the patient's hematocrit drops below normal levels, although at this stage this is usually due to the phenomenon of hemodilation rather than the presence of active bleeding. The nurse should also keep in mind that immediately after the procedure there may be increase in the patient's temperature which can either be attributed to poor control of the portal system during the TIPS placement or it may be indicative of bacteraemia or bile leakage.¹⁴⁻¹⁸

After his/her clinical stabilization the patient is taken to the ICU where he/she is further monitored until his/her discharge from the hospital. In particular, the patient's vital signs need to be subject to rigorous and systematic evaluation and any significant changes should be recorded. Apart from these indications, fecal blood detection and / or hematemesis, as well as a possible increase in abdominal circumference of the patient, may also suggest stent dysfunction (thrombosis, stenosis, migration) as well as recurrence of variceal bleeding. Checking the patency of the stent with the combination of both conventional and Doppler ultrasound (duplex sonography) is another important component of patient's monitoring process, since replacement and/or dilatation of TIPS not only increases the cost, but the morbidity of patients as well.¹⁴⁻¹⁸

Overall, it is important that the nurse understands that the patient may not be fully aware of the seriousness of the condition and the significance of his/her compliance to the recommended out-patient monitoring program. For this reason it is imperative that the patient be provided with written guidelines. A detailed discussion with the patient is also necessary for thorough clarification of the information included in the aforementioned guidelines.¹⁴⁻¹⁸ Throughout the patient's education there should be emphasized the need for conducting Doppler ultrasounds repeatedly to certify the patency of the stent. Moreover, it is imperative that the patient understands the reasons his/her diet is planned the way it is bearing in mind that

when a patient has to assume responsibility for his/her own diet, either as an outpatient or on discharge from hospital, the information provided must be practical and easily understood to facilitate his/her compliance with the dietary restrictions concerning fluid and protein consumption according to medical instructions.¹⁴⁻¹⁸

Understanding of signs and symptoms of hepatic encephalopathy (inability to concentrate, slow speech, emotional disturbance, a change in handwriting, inability to draw simple shapes or write down numbers, sleep disturbances, irritability, orientation disorders, lethargy, distinctive hand tremor, liver disease halitosis, slow response to stimuli) is another key aspect of the patient's self-management education program. If the patient shows signs and symptoms of hepatic encephalopathy, for the treatment of which lactulose and neomycin are required, the nurse should stress out the importance of proper and constant intake of the recommended dose (Note: the administration of disaccharide lactulose has a slight laxative effect and removes the toxins from the intestine, while both the pH and the absorption of ammonia are decreased. On the other hand, neomycin aims at the destruction of intestinal bacteria and the reduction of protein digestion). At the same time, it becomes imperative that the patient abides to the medical restrictions concerning protein consumption, so that the production of ammonia and other nitrogenous metabolites gets decreased.¹⁴⁻¹⁸

Family members can have a significant influence on the patient's attitude and behaviour and therefore should be considered for inclusion in any educational interventions.¹⁴⁻¹⁸

Although so far the effectiveness of TIPS has been evaluated only in small and non-randomized studies, the method appears to be a valuable alternative in cases of uncontrolled or recurrent variceal bleeding, achieving haemostasis in almost all patients (90-100%). However, the high rates of early recurrence of bleeding and mortality (30%), as well as the complications of the method, restrict its role only on patients resistant to

medication and endoscopic therapy, and it should not be applied as an initial therapy for variceal bleeding.¹⁹⁻²¹

Conclusions

TIPS is an accepted interventional procedure indicated for the select group of patients who either have variceal bleeding that does not respond to sclerotherapy, variceal banding, pharmacologic means, or who have intractable ascites. However, the procedure is associated with a number of complications, the most fearful of which is the potential development of encephalopathy. It is only with attentive and vigilant observation and thorough patient education by nursing staff that clinical changes are detected early. The collaboration of physicians and nurses in the ongoing monitoring and follow-up of these patients can contribute to an improved quality of life and reduced hospitalizations.

Bibliography

1. Bass N, Somberg K. Portal hypertension and gastrointestinal bleeding. In: Sleisenger & Fordtran 's. *Gastrointestinal and liver disease*. 6th edition, W.B. Saunders Company. 2000;2:1284-1309.
2. Oches A. Transjugular intrahepatic portosystemic shunt. *Dig Dis* 2005;23(1):56-64.
3. Boyer T, Henderson J. Portal hypertension and bleeding esophageal varices. In: Zakin D, Boyer T. *Hepatology: A textbook of liver disease*. 3th edition, W.B. Saunders company. 1996;Vol 1:720-755.
4. Brigham LE. Transjugular intrahepatic portosystemic shunt (TIPS). *Gastroenterol Nurs*. 1998; 21(6): 243-246.
5. Chau TN, Patch D, Chan YM, Nagrat A, Dick R, Burroughs AK. Salvage transjugular intrahepatic portosystemic shunt: gastic fungal compared with esophageal variceal bleeding. *Gastroenterology*. 1998;114(5):981-987.
6. Banares R, Casado M, Rodriguez-Laiz JM, Camúñez F, Matilla A, Echenagusía A, Simó G, Piqueras B, Clemente G, Cos E. Urgent transjugular intrahepatic portosystemic shunt for control of acute variceal bleeding. *Am J Gastroenterol*. 1998;93(1):75-79.
7. Sahagum G, Benner K, Saxon R, Barton RE, Rabkin J, Keller FS, Rosch J. Outcome of 100 patients after transjugular intrahepatic portosystemic shunt for variceal hemorrhage. *Am J Gastroenterol*. 1997;92(9):1444-1452.
8. Boyer TD, Haskal ZJ; American Association for the Study of Liver Diseases. The role of transjugular intrahepatic portosystemic shunt (TIPS) in the management of Portal Hypertension: update 2009. *Hepatology* 2010;51(1):306.
9. Kalva SP, Salazar GM, Walker TG. Transjugular intrahepatic portosystemic shunt for acute variceal hemorrhage. *Tech Vasc Interv Radiol* 2009;12(2):92-101. Review.
10. Fanelli F, Salvatori FM, Corona M, Bruni A, Pucci A, Boatta E, et al. Stent graft in TIPS: technical and procedural aspects. *Radiol Med*. 2006.111(5):709-723.
11. Sherlock S, Dooley J. The portal venous systemic and portal hypertension. In: Sherlock S, Dooley J, eds. *Disease of the liver and biliary system*. Ninth edition. Eds. Blackwell. 1993.p.p: 132-178.
12. Ferral H, Niles H.P. Selection criteria for patients undergoing transjugular intrahepatic portosystemic shunt procedures: current status. *J Vase Inter Radiol*. 2005; 16(4): 449-455.
13. Luketic V, Sanyal A. Esophageal varices. Clinical presentation, Medical Therapy and Endoscopic Therapy. *Gastroenterology Clinics of North America*. 2000; 29(2): 337-421.
14. McEwen DR. Management of alcoholic cirrhosis of the liver. *AORN J*. 1996; 64(2):209-223.
15. Maurogiannis Ch.. *Endoscopy Nursing*. Society Nursing Studies. Athens, 2001. (In Greek)
16. Burroughs AK. Acute management of bleeding oesophageal varices. *Drugs* 1992; 44 Suppl 2:14-23: discussion 70-72.

17. Society of Gastroenterology Nursing and Associates, Inc. Gastroenterology Nurse: A core curriculum, 2th edition:1998;299-306
18. Huffman SL. Transjugular intrahepatic portosystemic shunt (TIPS): a pediatric perspective. Gastroenterol Nurs.1994;17(3):95-99.
19. Rossle M, Haag K, Ochs A, Sellinger M, Noldge G, Perarnau JM, et al. The transjugular intrahepatic portosystemic stent-shunt procedure for variceal bleeding. N Engl J Med. 1994;330:165-171.
20. Laberge JM, Ring EJ, Gordon R, Lake JR, Doherty MM, Somberg KA, et al. Creation of transjugular intrahepatic portosystemic shunts with the Wallstent endoprosthesis: Results in 100 patients. Radiology 1993;187: 413-420.
21. Nietsch, Hubert H MD. Management of Portal Hypertension.2005;39(3):232-236.