

## TIPS or Transjugular intrahepatic

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### 1) Why to perform a TIPS ?

One of the liver's functions is to filter blood from the digestive tract. The blood arrives to the liver via the portal vein. Once filtered by the liver, it arrives in the hepatic veins, then into the inferior vena cava and thereby reaches the heart. The majority of blood travels through the liver without significant resistance to its flow. If blood flow through the liver is slowed down due to liver damage, portal hypertension may develop. This is the case when there is an obstruction of the portal vein branches or trunk, the hepatic veins (Budd-Chiari syndrome) or the hepatic capillaries due to liver diseases with or without such as cirrhosis. Portal hypertension can lead to symptoms such as ascites or digestive hemorrhage. These complications are not always well controlled by medical treatment nor endoscopy. In such cases, TIPS may be necessary to treat the complications of portal hypertension. The reduction in venous pressure induced by TIPS reduces the risk of hemorrhage and at least partially ascites retention.

### 2) What is a TIPS ?

A TIPS is a metal prosthesis or stent that is positioned in the liver between a hepatic vein and the portal vein. The prosthesis creates a channel (or shunt) between these two vessels, driving blood from the digestive tract directly to the heart. This bypass allows the blood to flow freely around the obstacle, reduces the pressure in the portal venous system and then controls the symptoms secondary to portal hypertension (ascites, hemorrhage).

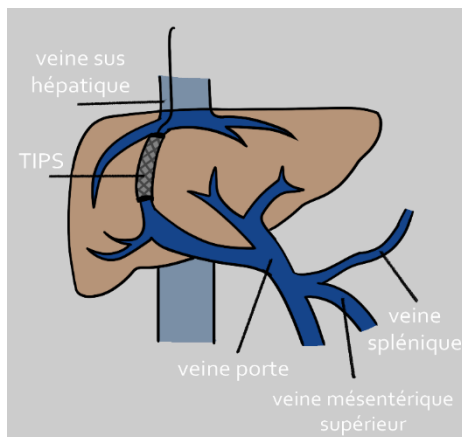
### 3) How is it placed ?

TIPS procedure is not surgical. It is performed under general anesthesia by a radiologist in an interventional radiology room.

Prior to the procedure, it is necessary to ensure that there are no contra-indications. Blood tests, cardiac ultrasound and abdominal CT-scan are systematically performed.

Antibiotic treatment (rifaximin) may be started approximately two weeks before the procedure, to reduce the risk of hepatic encephalopathy, a complication sometimes associated with the TIPS: (see paragraph 5).

Steps are monitored by the operator on a scopy screen.



1. Anaesthesia and skin disinfection, setting up sterile fields.
2. Internal jugular vein puncture in the neck and placement of a vascular introducer.
3. Identification of the hepatic vein (or inferior vena cava if the hepatic veins are no longer accessible), then of the portal vein by injection of iodinated contrast product.
4. Needle puncture of a portal vein branch from the hepatic vein (or vena cava) through the liver, with radiological and ultrasound guidance.
5. In the case of portal cavernoma, access to the portal vein may require an alternative to trans-jugular puncture: trans-hepatic puncture (through the liver) or trans-splenic puncture (through the splenic vein). If necessary, this allows the guide followed by a prosthesis to be passed through the portal thrombosis (or cavernoma)
6. The resulting channel is then enlarged using a balloon, enabling the metal prosthesis to be inserted between a branch of the portal vein and a hepatic vein.
7. Check that the prosthesis is correctly positioned and functioning properly by a further injection of contrast product and measurement of the venous pressures.
8. Removal of all equipment except the prosthesis(es), which cannot be removed once fitted.

The duration of the procedure varies according to the anatomy of the liver veins and the complexity of the operation. The patient is then monitored in the anaesthesia recovery room before returning in the intensive care unit or continuing care unit. In cases of vascular liver disease, TIPS requires hospitalisation for at least 5 days. Imaging controls (ultrasound, CT-scan) are necessary in the first 48 hours and in the first week after the procedure.

#### **4) Are there any specific requirements for TIPS depending on the location of the obstacle to blood flow through the liver?**

TIPS for Budd-Chiari syndrome or portal cavernoma must be performed by an experienced operator in a center with expertise in liver vascular disease. Indeed, in the case of vascular disease of the liver, there is a specific vascularization and hepatic dysmorphism which modifies the usual TIPS technique. These modifications may require the insertion of several prostheses to cover the entire TIPS pathway. In the case of Budd-Chiari syndrome, when no portion of the hepatic vein remains permeable, an approach through the vena cava is necessary. Another specificity of vascular diseases is that peri-operative management usually includes anticoagulant treatment and often specific treatment of the underlying prothrombotic state (e.g. antimetabolites). This specific therapeutic management must be carried out by haemostasis and pharmacology teams familiar with these issues.

In France, the network of expertise centers in vascular diseases of the liver (<https://www.filfoie.com/ou-consulter/reseau-maladies-vasculaires-foie/>) comprises 32 adult and paediatric expertise centers, 2 constitutive reference centers and 1 coordinating reference center which, due to their proven expertise in the management of these diseases, have been officially certified by the Ministry of Health as part of the National Plans for Rare Diseases. This network discusses and validates the indications and procedures for these interventions at regional or national multidisciplinary meetings.

#### **5) What are the risks and complications associated with this procedure?**

A distinction must be made between complications that may arise during the procedure or in its immediate aftermath, and those that may arise in the longer term.

##### During the procedure:

- Failure of the TIPS placement is rare, but possible.
- Locally, a haematoma may form at the level of the entry orifice in the neck, which will reabsorb in two to three weeks.
- Obstruction by immediate or rapid clotting of the duct created in the liver. A CT-scan performed systematically at an early stage can detect this possible complication. The treatment then consists of dilating or dissolving the clot. In some cases, treatment to dissolve the clot can be achieved by inserting a catheter that

infuses the treatment directly into the clot. This requires special monitoring and hospitalization in a continuing care unit or intensive care unit.

- In general, anaesthesia may involve a number of risks, which will be explained by the anaesthetist during the consultation prior to the operation. The injection of the iodine product may cause an intolerance reaction. In addition, diabetic patients taking biguanide drugs (metformin, Glucinan®, Glucophage®, Janumet®, Stagid®) should also be informed, as this treatment must be interrupted for 48 hours following the operation.
- Finally, during the operation, a bile duct may be affected or put into communication with a blood vessel, resulting in haemobilia. This usually resolves spontaneously once anticoagulant treatment has been discontinued. Occasionally, the bile ducts may need to be unblocked by digestive endoscopy of the stomach and duodenum.

### In the longer term

1. Obstruction of the TIPS. Narrowing can occur at any level of the TIPS. Its function is then disrupted, but ultrasound and/or cross-sectional imaging (scanner or MRI) make it possible to detect it before symptoms reappear. This anomaly is regularly detected by ultrasound and, in the event of significant narrowing, may lead to the decision to undergo a dilatation procedure.

2. Hepatic encephalopathy. This results from the fact that the liver does not immediately absorb substances produced by the intestine (particularly ammonia) due to the presence of TIPS. As a result, substances that normally only reach the brain in tiny quantities arrive there in large quantities. These disorders can be very varied and of varying degrees of severity: memory lapses, insomnia, attention problems, concentration problems, drowsiness. The purpose of taking rifaximin before TIPS is to prevent or limit the onset of these symptoms. Very rarely, chronicity or severity of symptoms, despite medical treatment, may lead to the suggestion of narrowing the diameter of the TIPS or obstructing it permanently.

**For more information on the indications for TIPS in cases of vascular disease, please refer to the 'TIPS, indications and modalities' recommendations recently published by the AFEF (Association Française d'Etude pour le Foie) (QR code attached).**

