Liver Cirrhosis. Interventional procedures: from biopsy to TIPS

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OSPEDALE PEDIATRICO

Declaration: no conflict of interest

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Interventional procedures

- *Cirrhosis is a complex diffuse process whereby the architecture of the liver has been replaced by abnormal nodules due to the presence of fibrosis.*
- *Interventional radiology procedures can enable the diagnosis and treatment of the diseases caused by liver cirrhosis, even in the pediatric population.*
- *To date literature regarding interventional radiology in the setting of pediatric cirrhosis is limited.*

Interventional procedures

- *Common procedures usually performed by interventional radiologist can include percutaneous and transjugular liver biopsies performed with ultrasonographic and fluoroscopic guidance or several endovascular diagnostic examinations, such as hepatic venous portography.*

- *interventional radiology plays a pivotal role in the treatment and management of refractory portal hypertension through procedures such as balloon occluded retrograde transvenous obliteration (BRTO), partial splenic embolization (PSE) and transjugular intrahepatic portosystemic shunt (TIPS)*

Liver Biopsy

- may be considered the gold standard procedure to obtain a liver sample for histopathological examination, supporting diagnosis, management and prognosis of many pediatric acute or chronic liver diseases.

- can be performed percutaneously with US-guidance, or with the transjugular approach, depending on the clinical status and laboratory results of the pediatric patient.

Liver Biopsy

- *Pre abdomino-pelvic ultrasound examination (free intraperitoneal fluid, interpositio coli or marked dilatation of the biliary tree).*
- *INR (range 0.9-1.2), platelet count (>60.000 U/mm3) antiaggregant or anticoagulant therapy (an abnormal coagulation status being a firm contraindication)*
- *under US-guidance*
- *bioptic needle: 16 to 18 G*

Liver Biopsy

MEDICAL POSITION PAPER

CME

Liver Biopsy in Children: Position Paper of the ESPGHAN Hepatology Committee

*Antal Dezsőfi, †Ulrich Baumann, ‡Anil Dhawan, §Ozlem Durmaz, ||Björn Fischler, ¶Nedim Hadzic, #Loreto Hierro, **Florence Lacaille, ††Valérie A. McLin, ‡‡Valerio Nobili, §§Piotr Socha, ||||Pietro Vajro, and ¶¶Alexander S. Knisely

Liver Biopsy

JPGN • Volume 60, Number 3, March 2015

Liver Bio

*Antal
¶Nedim H

COMPLICATIONS OF LB

Complications of LB (Tables 1 and 2) (63,79–84) are usually considered to be ''major'' or ''minor.'' We consider ''minor'' complications to include pain, subcapsular bleeding that does not require transfusion or prolonged hospitalisation, infection, minor bile leak or haemobilia, and arteriovenous fistula. ''Major'' complications include bleeding, including haemobilia, that requires transfusion, surgery, or intensive care management; pneumothorax or haemothorax; and death (78).

Liver Biopsy

- *Several reports in literature describe an incidence of major complications ranging from 0% to 4.6 %, leading to consider pediatric percutaneous liver biopsies a safe procedure with a high diagnostic yield.*

Liver Biopsy

ORIGINAL ARTICLE: HEPATOLOGY AND NUTRITION

Evaluation of Risk Factors for Bleeding After Liver Biopsy in Children

*Birgitte H. Westheim, †Anniken B. Østensen, ‡Ingegerd Aagenæs, †Truls Sanengen, and *Runar Almaas

cidence of .6 %, leading to consider pediatric percutaneous liver biopsies a safe procedure with a high diagnostic yield.

Liver Biopsy

ORIGINAL ARTICLE: HEPATOLOGY AND NUTRITION

Evaluation of Risk Factors for Bleeding

Pediatr Radiol (2012) 42:1322–1325
DOI 10.1007/s00247-012-2433-z

*Birgitte H. Westh

ORIGINAL ARTICLE

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Effectiveness and safety of ultrasound-guided percutaneous liver biopsy in children

Hugo Matos · Maria José Noruegas · Isabel Gonçalves · Conceição Sanches

Liver Biopsy

ORIGINAL ARTICLE: HEPATOLOGY AND NUTRITION

Evaluation of Risk Factors for Bleeding

Pediatric Imaging • Original Research

*Bir

Sonography-Guided Percutaneous Liver Biopsies in Children

Pradeep Govender[1]
Maureen M. Jonas[2]
Ahmad I. Alomari[1]
Horacio M. Padua[1]
Brian J. Dillon[1]
Mary F. Landrigan-Ossar[3]
Gulraiz Chaudry[1]

OBJECTIVE. The purpose of this study was to evaluate the safety and efficacy of sonography-guided percutaneous core needle liver biopsy in infants and children.

MATERIALS AND METHODS. We conducted a retrospective analysis of all patients who underwent sonography-guided percutaneous core needle liver biopsies over a 7.5-year period by pediatric interventionalists at a single tertiary center.

RESULTS. A total of 597 procedures were performed in 470 patients (270 male and 200 female), with a mean age of 10.5 years (age range, 1 month–21 years). The main indications for biopsies were abnormal liver enzymes (n = 129, 21.6%), grading and staging of chron-

Liver Biopsy

ORIGINAL ARTICLE: HEPATOLOGY AND NUTRITION

Evaluation of Risk Factors for Bleeding

Pediatric Imaging • Original Research

ORIGINAL ARTICLE: HEPATOLOGY AND NUTRITION

US-Guided Percutaneous Liver Biopsy in Pediatric Liver Transplant Recipients

*Soma Mandal, †Roberto Miraglia, †Luigi Maruzzelli, †Rosa Liotta, ‡Fabio Tuzzolino, §Marco Spada, ||Silvia Riva, and †Angelo Luca

Mary F. Landrigan-Ossar[3]
Gulraiz Chaudry[1]

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Liver Biopsy

ORIGINAL ARTICLE: HEPATOLOGY AND NUTRITION

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Pediatr Radiol (2009) 39:959–961
DOI 10.1007/s00247-009-1311-9

ORIGINAL ARTICLE

Is juvenile liver biopsy unsafe? Putting an end to a common misapprehension

US-

Andrea Pietrobattista · Rodolfo Fruwirth · Gianluigi Natali · Lidia Monti · Rita Devito · Valerio Nobili

*Som

Mary F. Landrigan-Ossar[3]
Gulraiz Chaudry[1]

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Liver Biopsy

- To avoid major complications (hemoperitoneum), transjugular biopsy is a satisfactory and better tolerated option
- The bioptical procedure via the venous system reduces the risks of bleeding because the Glisson's capsule is not perforated
- If bleeding does occur, it returns promptly into the venous system rather than into the peritoneum
- Major costs and longer periprocedural time

Liver Biopsy

- *In general, indications to transjugular liver biopsy are contraindications to percutaneous biopsy*

-high prothrombin level
-platelet count less than <60.000 U/mm^3
- INR > 1.5,
- intraperitoneal fluid
- antiaggregant or anticoagulant therapies
-previous unsuccessful percutaneous biopsy
- morbid obesity
- atrophic liver
- cardiac liver
-hemodialysis and chronic renal insufficiency
- hereditary hemorrhagic teleangiectasia

Liver Biopsy

- *Contraindications of transjugular liver biopsy:*

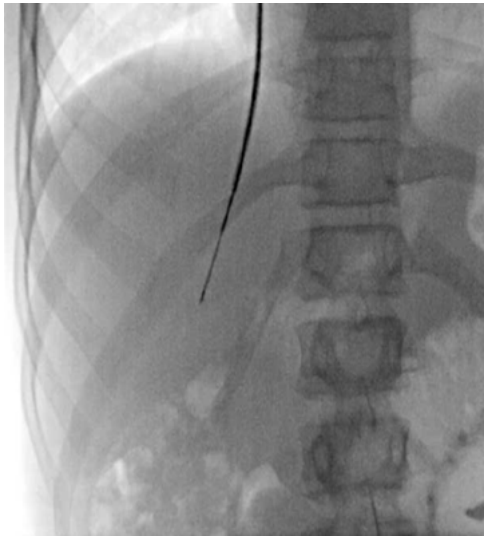
  -thrombosis in the right internal jugular vein

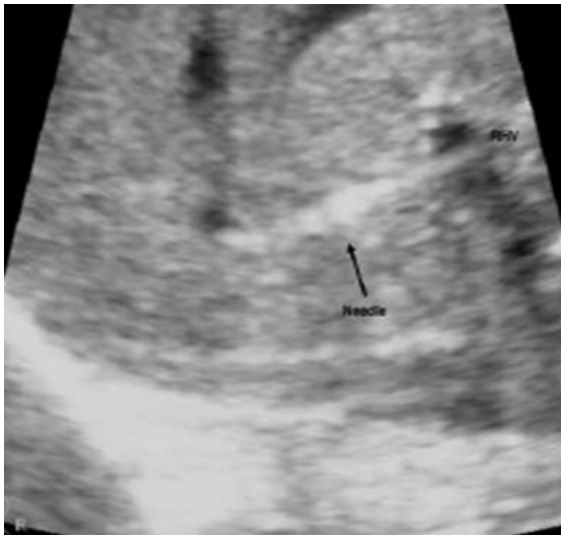
  -thrombosis of hepatic veins

  -hydatid cysts

  -cholangitis

Liver Biopsy





Portal hypertension

- *In pediatric patients, pre-hepatic portal vein thrombosis (PHPVT) is the most common cause of PH and upper gastrointestinal bleeding*

-iatrogenic injury by neonatal catheterization of the umbilical vein
- infection (omphalitis)
-intra-abdominal abscess
-sepsis
-severe dehydration
-abdominal trauma
-unknown causes (idiopathic extra-hepatic PH)

Portal hypertension

- *PHPVT can result in cavernous transformation of the extra-hepatic portal vein*

  -deterioration of PH
  -development of liver dysfunction
  -biliary disease
  -coagulopathy
  -splenomegaly
  -ascites

Portal hypertension

Main target of treatment in pediatric PH is to prevent the development and bleeding of upper gastrointestinal varices

medical therapy, surgical ligament or sclerotherapy

fail: surgical treatment

Portal hypertension

- *Liver transplantation is the major therapy for pediatric patients with primary liver disease resulting in cirrhosis and end-stage liver disease*

- *Surgical non-selective portosystemic shunt (mesocaval and portocaval shunt) reduce PH but higher rates of clinical complications: hepato-pulmonary syndrome, encephalopathy or hyperammonemia*

- *Surgical selective shunt, distal splenorenal "Warren" shunt, allows decompression of gastro-esophageal varices and preserves the antegrade perfusion to the liver with less developing clinical consequences*

Portal hypertension

- *"Meso-Rex" bypass is the gold-standard treatment for PHPVT in children with preserved anatomy*
- *is a venous conduit connecting the infra-pancreatic superior mesenteric vein to the IHLPV at the Rex recess, the remnant of embryonic umbilical vein*
- *restores physiological hepatopetal portal flow, avoiding dangerous complications of a portosystemic shunting*

Portal hypertension

Preoperative imaging is pivotal in the setting of surgical planning

While CT and MRI confirm PHPVT diagnosis and evaluate the extension of portal cavernoma and size of the extra- and intra-hepatic portal system

Wedged hepatic venous portography is the mainstay imaging examination for assessing the surgical feasibility of Meso Rex bypass

Portal hypertension

- *Consists of retrograde (indirect) phlebography of the intra-hepatic portal venous system performed through wedged catheterization of the suprahepatic veins via the right internal jugular vein*

- *The goal of the procedure is to evaluate the patency of both the Rex recess and LPV and to assess the reciprocal communication between right and left intra-hepatic portal veins*

Portal hypertension

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Contents lists available at ScienceDirect

Journal of Pediatric Surgery

journal homepage: www.elsevier.com/locate/jpedsurg

Intrahepatic portal venous systems in children with noncirrhotic prehepatic portal hypertension: Anatomy and clinical relevance

Arianna Bertocchini [a], Pierluigi Falappa [b], Chiara Grimaldi [a], Giuseppe Bolla [b], Lidia Monti [c], Jean de Ville de Goyet [a,*]

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Portal hypertension

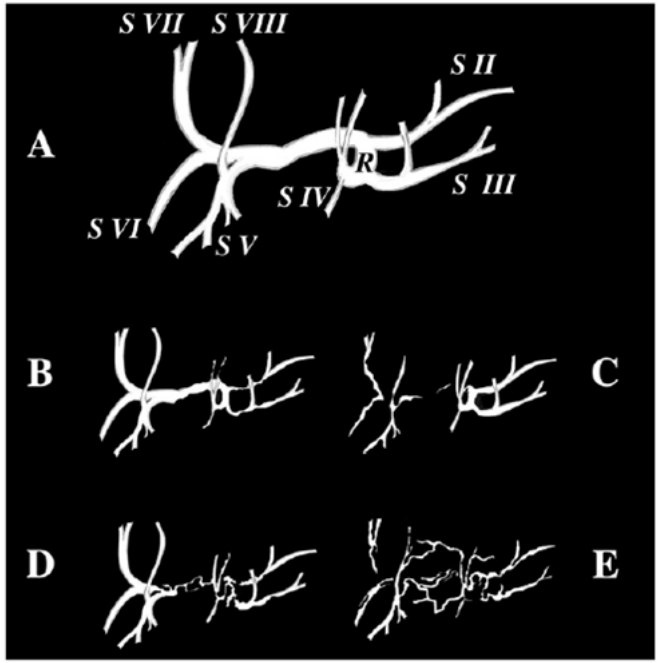

Fig. 2. Schematic representation of types of intrahepatic portal system anatomy in patients with portal cavernoma. (A) Patent IHPS (legend of picture: hepatic segments numbered S2 II to SVIII (according Couinaud) and Rex recessus®). (B) Patent IHPS with parietal abnormalities within the left liver. (C) Partially patent IHPS with thrombosed right liver. (D) Partially patent IHPS with thrombosed left liver. (E) Extensive thrombosis of the main portal vein radicals in the liver.

t ScienceDirect

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er.com/locate/jpedsurg

en with noncirrhotic
d clinical relevance

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[a], Giuseppe Bolla [b],

ome, Italy
Italy
pital, Rome, Italy

Portal hypertension

- *Meso Rex bypass only for children with patent Rex recess (subtype A to C) and conservative follow-up for clinically stable patients or portosystemic shunt creation in the case of complicated PH.*

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Intrahepatic portal venous systems in children with noncirrhotic prehepatic portal hypertension: Anatomy and clinical relevance

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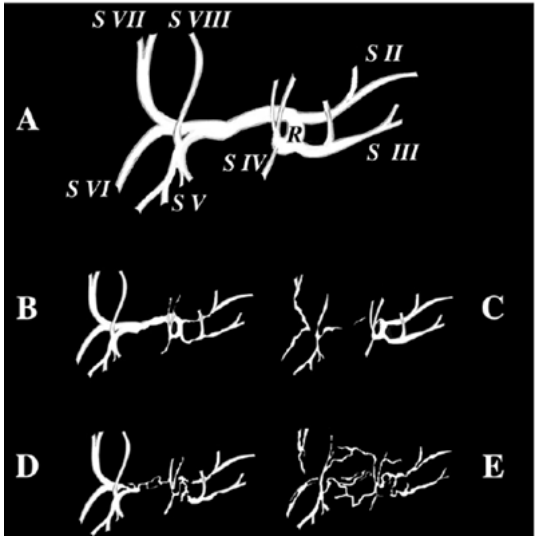
[c] HepatoBilio and Digestive Radiology Unit, Department of Imaging, Bambino Gesù Children's Hospital, Rome, Italy



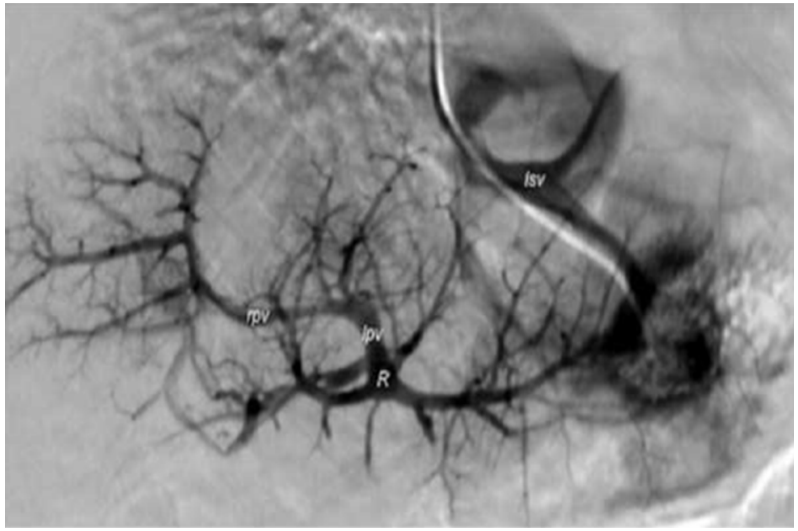
Portal hypertension

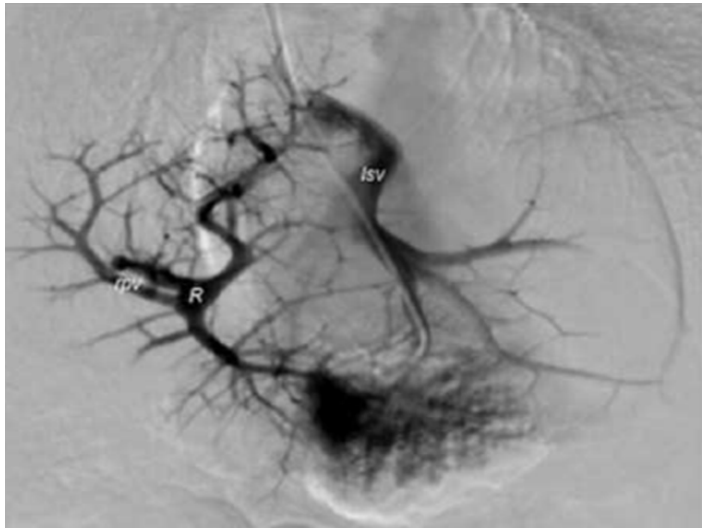
- *Furthermore hepatic venous pressure gradient can be measured simultaneously to provide important supportive diagnostic information*

  -pressure threshold ≥ 10 mmHg is predictive of the formation of varices

  -pressure threshold ≥ 12 mmHg is associated with decompensation with ascites or/and variceal bleeding

Portal hypertension





Portal hypertension

- *Interventional radiology is usually the first treatment choice in the case of stenosis or occlusion of the shunt through angioplasty, stenting or thrombectomy:*

Management of Portal Hypertension in the Pediatric Population: A Primer for the Interventional Radiologist

Victoria Young, MD[1,2] Shankar Rajeswaran, MD[2,3]

[1] Department of Diagnostic Radiology, Northwestern Memorial Hospital, Chicago, Illinois
[2] Department of Interventional Radiology, Northwestern Memorial Hospital, Chicago, Illinois
[3] Department of Pediatric Vascular and Interventional Radiology, Ann & Robert H. Lurie Children's Hospital of Chicago, Chicago, Illinois

Address for correspondence Victoria Young, MD, Department of Diagnostic Radiology, Northwestern Memorial Hospital, Chicago, IL 60611 (e-mail: victoria.young@northwestern.edu).

Semin Intervent Radiol 2018;35:160–164

Portal hypertension

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Abdominal Radiology (2019) 44:1379–1394
https://doi.org/10.1007/s00261-018-1836-1

REVIEW

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Multimodality imaging of the Meso-Rex bypass

Victoria Yo

Vincenzo Carollo[1] · Gianluca Marrone[1] · Kelvin Cortis[2] · Giuseppe Mamone[1] · Settimo Caruso[1] · Mariapina Milazzo[1] · Luigi Maruzzelli[1] · Fabrizio di Francesco[1] · Martin Delle[3] · Roberto Miraglia[1] · Jean de Ville de Goyet[1]

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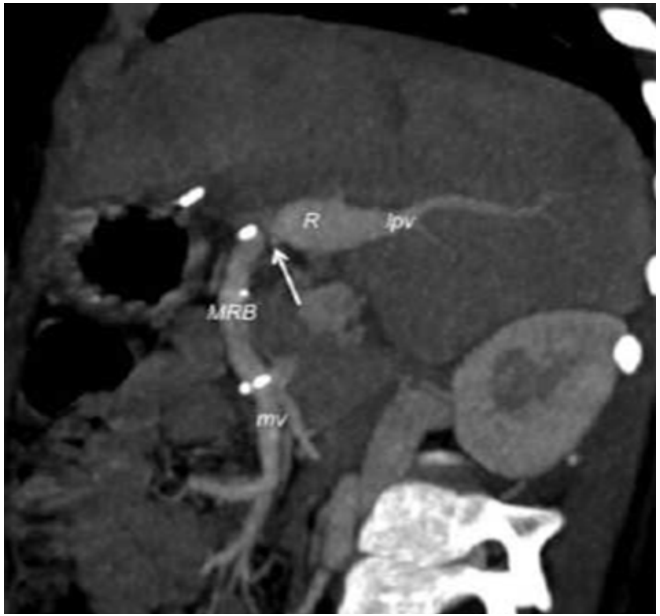
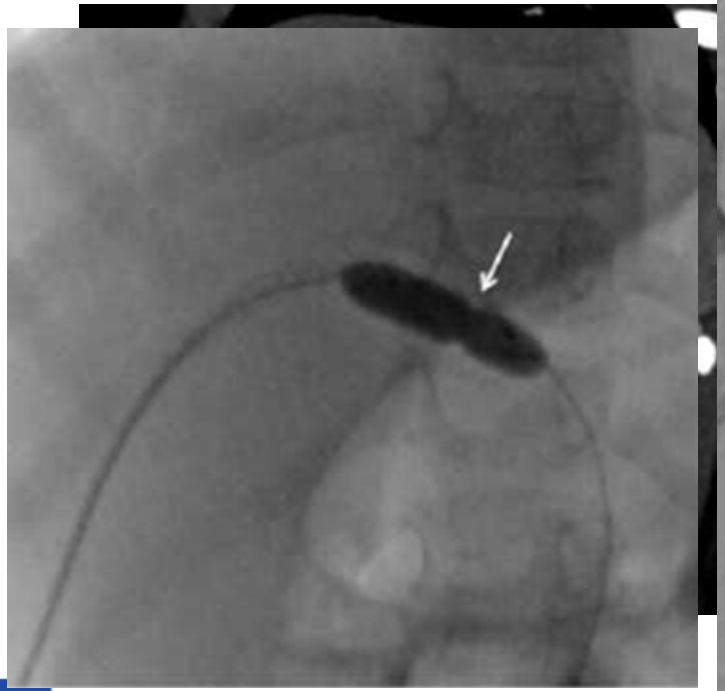
Published online: 22 November 2018

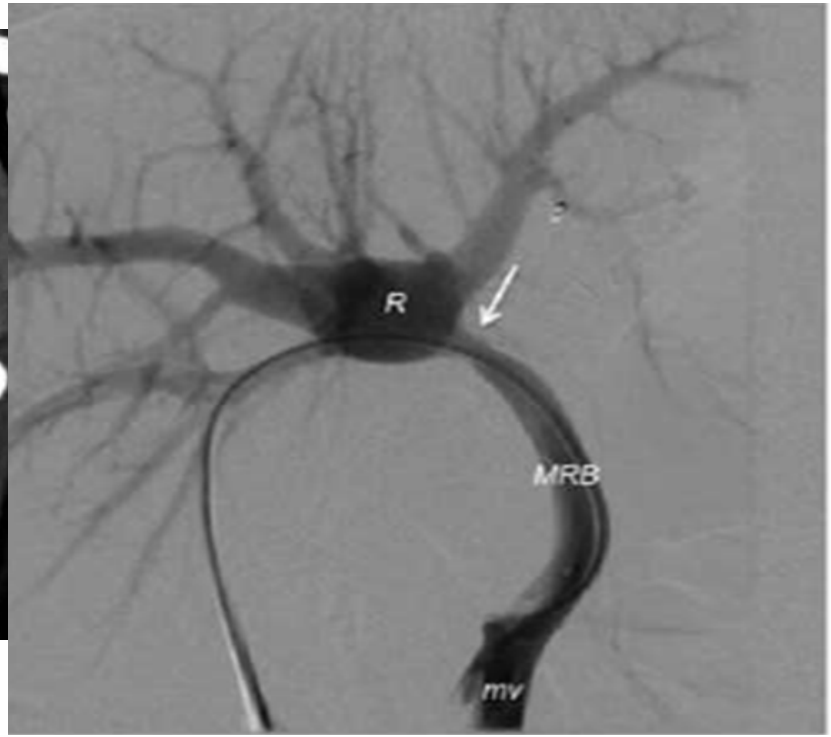
Semin Intervent Radiol 2018;35:160–164

Portal hypertension



Portal hypertension





Portal hypertension

- *Interventional radiology is usually the first treatment choice in the case of stenosis or occlusion of the shunt through angioplasty, stenting or thrombectomy:*

ORIGINAL ARTICLE: HEPATOLOGY

Recanalization of Chronic Extrahepatic Portal Vein Obstruction in Pediatric Patients Using a Minilaparotomy Approach

*Sydne Muratore, †Siobhan Flanagan, †David Hunter, and ‡Robert Acton

JPGN • Volume 68, Number 3, March 2019

Portal hypertension

- *Intervention*
  in the case
  angioplasty

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*Sydne

Received: 16 August 2017 | Revised: 5 July 2018 | Accepted: 5 July 2018
DOI: 10.1111/ajt.15022

ORIGINAL ARTICLE

AJT

Long-term outcomes of transmesenteric portal vein recanalization for the treatment of chronic portal vein thrombosis after pediatric liver transplantation

A. C. B. S. Cavalcante[1] | C. E. Zurstrassen[1] | F. C. Carnevale[2] | R. P. S. Pugliese[3,4] | E. A. Fonseca[3,4] | A. M. Moreira[2] | J. P. K. Matushita Jr[1] | H. L. L. Cândido[3,4] | M. A. R. Benavides[3,4] | I. K. Miura[3,4] | V. L. B. Danesi[3,4] | A. P. M. Hirschfeld[3,4] | C. B. V. Borges[3,4] | G. Porta[3,4] | P. ChapChap[4] | J. Seda-Neto[3,4]

BALLOON-OCCLUDED RETROGRADE TRANSVENOUS OBLITERATION (BRTO)

- *Bleeding from ruptured esophagogastric varices (EGV) is one of the most serious complications in patients with liver cirrhosis and is a major cause of death in these patients.*

- *BRTO has been commonly used for the prevention and treatment of bleeding EGV in Japan and has also become popular elsewhere in Asia. Only recently gained wider attention in America and Europe and still underused.*

BALLOON-OCCLUDED RETROGRADE TRANSVENOUS OBLITERATION (BRTO)

- *Indications:*
  - active or impending EGV bleeding
  - EGV with hepatic encephalopathy refractory to medical management.

- *Contraindications:*
  - severe uncontrollable coagulopathy associated with liver failure,
  - splenic vein thrombosis,
  - portal vein thrombosis
  - uncontrolled bleeding from EGV

BALLOON-OCCLUDED RETROGRADE TRANSVENOUS OBLITERATION (BRTO)

- *Endovascular closure of the portosystemic shunt outflow, using an occlusion balloon followed by injection of a sclerosing agent directly into the gastro-variceal complex.*
- *Flow stagnation is helpful to maximize the effect of the sclerosing agent leading to thrombosis.*
- *Possible adverse effects of BRTO include transient ascites, pleural effusion, and worsening of esophageal varices due to elevation of portal pressure in response to occlusion of the portosystemic shunt.*

BALLOON-OCCLUDED RETROGRADE TRANSVENOUS OBLITERATION (BRTO)

PO Box 2345, Beijing 100023, China
www.wjgnet.com
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World J Gastroenterol 2006 June 28; 12(24): 3866-3873
World Journal of Gastroenterology ISSN 1007-9327

CLINICAL RESEARCH

Efficacy of balloon-occluded retrograde transvenous obliteration, percutaneous transhepatic obliteration and combined techniques for the management of gastric fundal varices

Hirotaka Arai, Takehiko Abe, Hitoshi Takagi, Masatomo Mori

Bleeding control rate of gastric varices after BRTO is described as greater than 90% and therefore could be attempted in patients with a poor hepatic functional reserve and even in patients with encephalopathy.

BALLOON-OCCLUDED RETROGRADE TRANSVENOUS OBLITERATION (BRTO)

Reviews report high rates (> 90%) of complete eradication of gastric varices and low rates (< 10%) of gastric variceal recurrence during long-term follow-up compared to endoscopic variceal obliteration.

Long-term follow-up of gastric variceal sclerotherapy: an eleven-year experience

Shiv K. Sarin, MD

New Delhi, India

SPLENIC EMBOLIZATION

- *In cirrhotic liver the condition of portal hypertension causes splenomegaly often associated with hypersplenism.*
- *Hypersplenism is a well-known clinical haematologic syndrome caused by an enlarged and overactive spleen, and is characterized by thrombocytopenia (64%-84%), leucopenia (5%), neutropenia and anemia.*
- *Hypersplenism may worsen the course of the disease because of the increased risk of infection and bleeding, and it could also adversely affects the administration of drugs*
- *Portal hypertension determines formation of esophageal varices which, in combination with decreased hematological indices, puts patients with chronic liver cirrhosis at risk of potential life-threatening bleeding.*

SPLENIC EMBOLIZATION

- *Surgical splenectomy has been traditionally performed in hypersplenism accompanying chronic liver disease.*
- *Effective in improving hematological indices this surgical procedure carries significant perioperative and postoperative risks.*
- *According to literature the morbidity from complications after laparoscopic and open splenectomy ranges from 9.6% to 26.6%.*

SPLENIC EMBOLIZATION

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- According to literature the morbidity from complications after laparoscopic and open splenectomy ranges from 9.6% to 26.6%.

Available online at www.sciencedirect.com
ScienceDirect
Digestive and Liver Disease 41 (2009) 411–416
Digestive and Liver Disease
www.elsevier.com/locate/dld

Liver, Pancreas and Biliary Tract

Partial splenic embolization for hypersplenism in cirrhosis: A long-term outcome in 62 patients

K. Zhu, X. Meng, J. Qian, M. Huang, Z. Li, S. Guan, Z. Jiang, H. Shan*

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Received 7 July 2008; accepted 8 October 2008
Available online 12 December 2008

SPLENIC EMBOLIZATION

- *Major complications include portal vein and mesenteric vein thrombosis and higher rates of overwhelming sepsis from encapsulated bacteria.*

- *As widely documented in literature children are particularly vulnerable to post-splenectomy sepsis.*

SPLENIC EMBOLIZATION

Home > Radiology > VOL. 155, NO. 2

- **Partial splenic embolization in children with hypersplenism.**

  D A Kumpe, C M Rumack, D H Pretorius, T J Stoecker, G P Stellin

  Published Online: May 1 1985 | https://doi.org/10.1148/radiology.155.2.3885306

SPLENIC EMBOLIZATION

Home > Radiology > VOL

- Partial splen
  hypersplenis

  D A Kumpe, C M Rumac

  Published Online: May

NIH Public Access
Author Manuscript
J Pediatr Hematol Oncol. Author manuscript; available in PMC 2012 July 1.

Published in final edited form as:
J Pediatr Hematol Oncol. 2011 July ; 33(5): 383–386. doi:10.1097/MPH.0b013e3182172515.

Subtotal splenic embolization is a safe and effective treatment for isolated splenic vascular tumors associated with consumptive coagulopathy

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Marc DiFazio, MD, and
Pediatric Subspecialty Services, Shady Grove Adventist Health Care System

John J. Strouse, MD
Division of Pediatric Hematology, Johns Hopkins University, Baltimore, Maryland

SPLENIC EMBOLIZATION

- *In the last few decades partial splenic embolization (PSE) has emerged as an excellent alternative to surgical splenectomy in the setting of portal hypertension*
- *In 1973, Maddison was the first to describe SE for the treatment of thrombocytopenia and variceal bleeding in cirrhosis.*
- *Major complications (splenic abscess, splenic rupture, pneumonia and septicaemia) following splenic embolization were described.*
- *In 1979, Spigos et al. described a modified PSE approach with limited volume embolization paired with antibiotic prophylaxis, and effective postembolization pain control.*

SPLENIC EMBOLIZATION

- *In the last few decades partial splenic embolization (PSE) has emerged as an excellent alternative to surgical splenectomy in the effective postembolization pain control.*

Partial Splenic Embolization in the Treatment of Hypersplenism

D. G. SPIGOS,[1] O. JONASSON,[2] M. MOZES,[2] AND V. CAPEK[1]

Transcatheter embolization of the spleen has been associated with serious complications, such as splenic abscess, rupture of the spleen, pneumonia, and septicemia. These complications, with their grave consequences, have prevented the use of this procedure as an alternative to operative splenectomy in selected cases. A detailed description of our method, which consists of partial splenic embolization, antibiotic prophylaxis, adequate pain control, and careful pre- and postembolization, is reported. Thirteen patients with hypersplenism were successfully treated with transcatheter partial embolization of their spleen.

The risks and potential benefits of splenic embolization were explained to each patient and informed consent was obtained. Preparatory measures included whole body povidone-iodine (Betadine) baths both the night before and the morning of embolization. All patients began antibiotic prophylaxis 6 hr before embolization, which consisted of 1,000,000 IU of penicillin G injected intramuscularly and gentamycin 3 mg/kg. Penicillin and gentamycin were continued for 5 days. Strict aseptic technique was observed in the angiography

SPLENIC EMBOLIZATION

- *Embolization is carried out according to guidelines based on Spigos's reccomandations (i.e. antibiotic prophylaxis, pain control, limited volume embolization).*
- *Selective partial embolization: only a few targeted distal branches of the splenic artery are completely embolized.*
- *Non-selective partial embolization: the embolic materials are injected more proximally in the main splenic artery, but beyond the origin of pancreatic branches.*

SPLENIC EMBOLIZATION

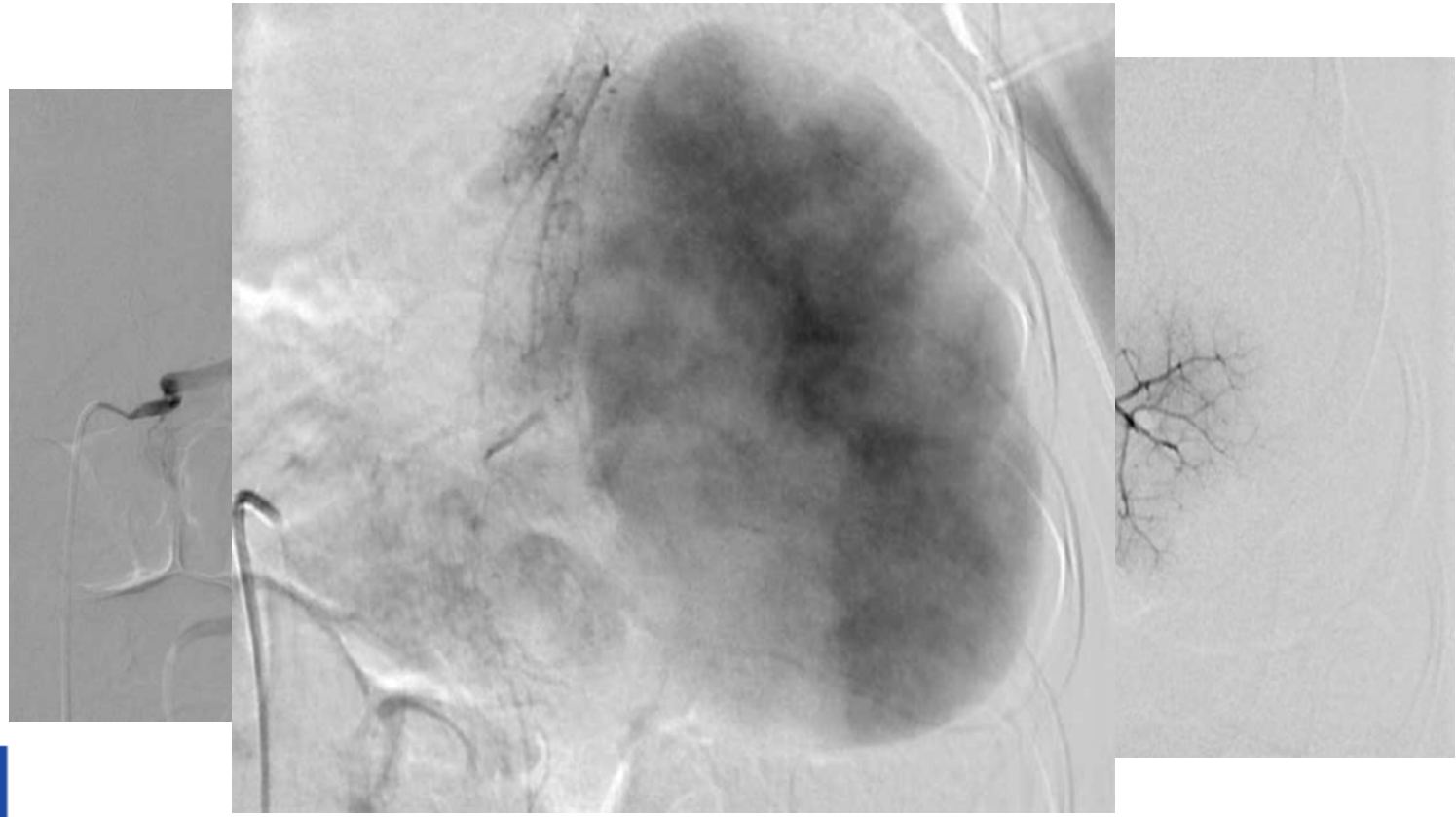
- *According to literature, in cirrhotic patients the ideal splenic volume target of PSE should be 50% to 70%.*
- *A higher incidence of complications is described when embolization involves more than 70% of the total splenic volume.*
- *PSE has become a safe procedure for pediatric patients if certain criteria are met (procedure performed by an experienced interventional radiologist, maximum of 70% spleen infarction, respect of aseptic conditions, use of antibiotics, and highly effective analgesia to prevent pulmonary complications).*

SPLENIC EMBOLIZATION

- *"Post embolization syndrome" is observed in most patients, at a frequency of 73.4%.*
- *Is considered a minor complication, and consists mainly of fever, nausea, left upper quadrant pain and perisplenic fluid collection.*
- *According to literature these symptoms are usually controlled with antibiotic prophylaxis, narcotics and antiemetics.*
- *PSE preserves a residual functional spleen as a protection against infections.*

SPLENIC EMBOLIZATION

SPLENIC EMBOLIZATION



Tips: Transjugular Intrahepatic Porto-Systemic Shunt

- *In adult cirrhotic patients, transjugular intrahepatic portosystemic shunt (TIPS) represents a common procedure for treating the complications of portal hypertension , especially to avoid variceal bleeding while awaiting liver transplantation*

- *Indications for TIPS in both adults and children include uncontrolled variceal hemorrhage, refractory ascites, hepatic pleural effusion, hepatorenal syndrome, veno-occlusive disease, and Budd–Chiari syndrome.*

Tips: Transjugular Intrahepatic Porto-Systemic Shunt

STANDARDS OF PRACTICE

Quality Improvement Guidelines for Transjugular Intrahepatic Portosystemic Shunts

Sean R. Dariushnia, MD, Ziv J Haskal, MD, Mehran Midia, MD, FRCPC, Louis G. Martin, MD, T. Gregory Walker, MD, Sanjeeva P. Kalva, MD, Timothy W.I. Clark, MD, Suvranu Ganguli, MD, Venkataramu Krishnamurthy, MD, Cindy K. Saiter, NP, and Boris Nikolic, MD, MBA
(for the Society of Interventional Radiology Standards of Practice Committee)

uncontrolled variceal hemorrhage, refractory ascites, hepatic pleural effusion, hepatorenal syndrome, veno-occlusive disease, and Budd–Chiari syndrome.

Tips: Transjugular Intrahepatic Porto-Systemic Shunt

Special Communications

American Association for the Study of Liver Diseases Practice Guidelines: The Role of Transjugular Intrahepatic Portosystemic Shunt Creation in the Management of Portal Hypertension

Thomas D. Boyer, MD, and Ziv J. Haskal, MD

J Vasc Interv Radiol 2005; 16:615–629

- an
- ple
- disease, and Budd–Chiari syndrome.

Tips: Transjugular Intrahepatic Porto-Systemic Shunt

- *TIPS placement is considered difficult in children (distorted hepatic vascularization, modified liver anatomy or segmental liver grafts).*
- *Children with <10 kg of body weight may not tolerate TIPS due to size of the device and hemodynamic changes that follow the placement of a large shunt (remarkable increase of the venous return to the right heart).*
- *However, the procedure is not impossible.*

Tips: Transjugular Intrahepatic Porto-Systemic Shunt

Diagnostic and Interventional Imaging (2020) 101, 685—687

LETTER / *Interventional imaging*

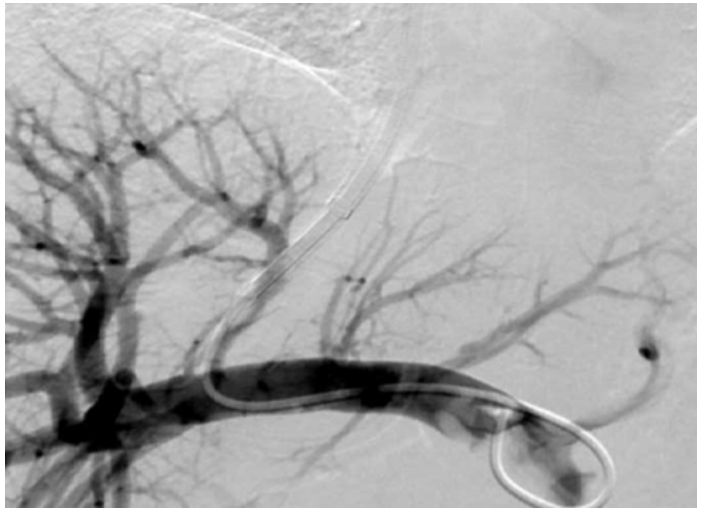
Transjugular intrahepatic portosystemic shunt placement in an infant weighing less than 22 pounds

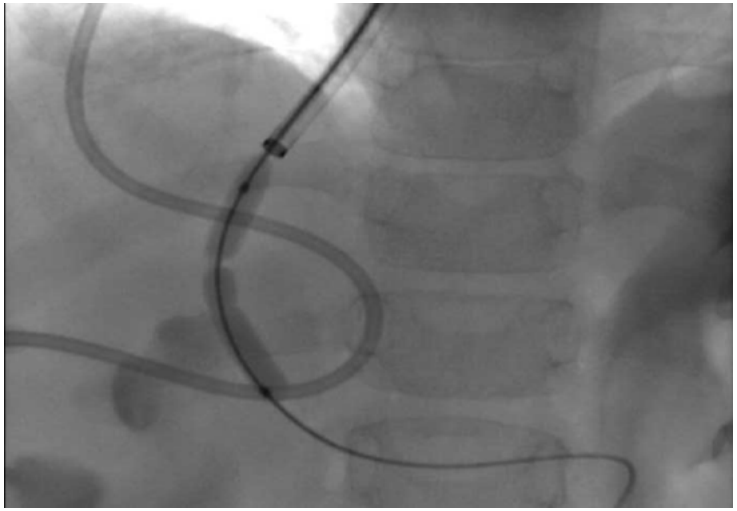
number and size of stents. After general anesthesia, a 6-F introducer (Terumo) was placed into the right internal jugular vein and a 4-F straight catheter (Cordis) over a 0.035'wire (Terumo) was used to catheterize the right hepatic vein. Hepatic venous pressure gradient (HVPG) was 12 mmHg. A

Tips: Transjugular Intrahepatic Porto-Systemic Shunt

- *Pediatric TIPS creation generally parallels the technique used in adult patients, incorporating occasional modifications dictated by patient size and anatomy.*
- *Liver Access Sets modified for pediatric patients are available and use an 18-gauge Colapinto needle and 7-F sheath; however, they are not amenable for delivery of ePTFE-covered stents.*
- *Intravascular US is another tool available for TIPS creation in both children and adults.*

Tips: Transjugular Intrahepatic Porto-Systemic Shunt





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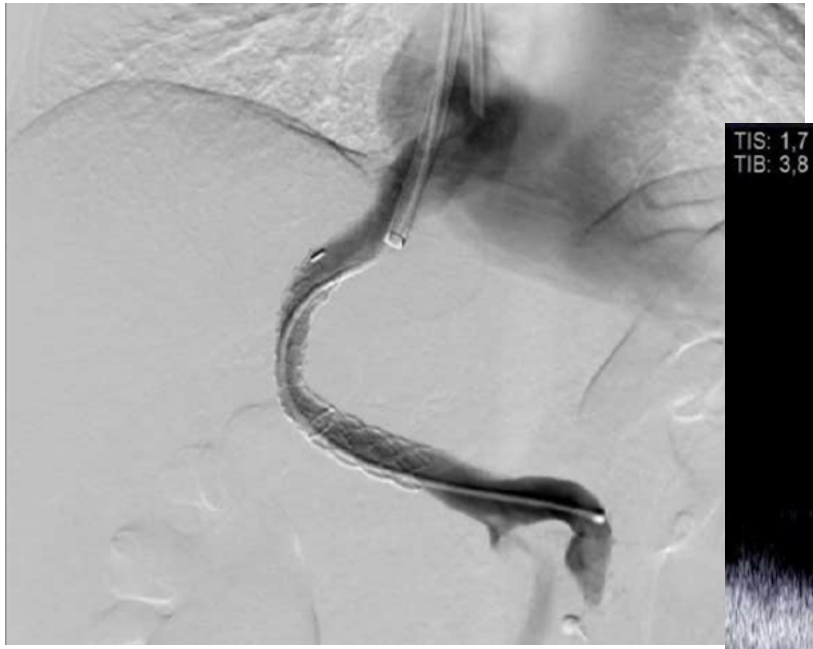

Tips: Transjugular Intrahepatic Porto-Systemic Shunt

- Stent diameters are selected by the operator in relation to the child's height and weight and size of the portal vein.
- The goal of stent placement: gentle curve with the distal end extending 2 cm into the portal vein and the proximal end extending near to the hepatic vein/inferior vena cava confluence.

Tips: Transjugular Intrahepatic Porto-Systemic Shunt

Pediatric Radiology (2019) 49:128–135
https://doi.org/10.1007/s00247-018-4267-9

ORIGINAL ARTICLE

Technical success and outcomes in pediatric patients undergoing transjugular intrahepatic portosystemic shunt placement: a 20-year experience

Jacob S. Ghannam [1] · Michael R. Cline [1] · Anthony N. Hage [1] · Jeffrey Forris Beecham Chick [1,2] · Rajiv N. Srinivasa [1] · Narasimham L. Dasika [1] · Ravi N. Srinivasa [1,3] · Joseph J. Gemmete [1]

Received: 27 April 2018 / Revised: 26 July 2018 / Accepted: 24 September 2018 / Published online: 6 October 2018

"successfully performed TIPS placement in 20 out of 21 children. Eighty percent of these children had a reduction of the portosystemic gradient to ≤12 mmHg, with no recurrence of variceal hemorrhage or refractory ascites"

Tips: Transjugular Intrahepatic Porto-Systemic Shunt

The technical success of this study mirrors reported rates in the literature.

Tips: Transjugular Intrahepatic Porto-Systemic Shunt

ORIGINAL ARTICLE: HEPATOLOGY AND NUTRITION

Feasibility and Efficacy of Transjugular Intrahepatic Portosystemic Shunt (TIPS) in Children

*Angelo Di Giorgio, †Roberto Agazzi, ‡Daniele Alberti, §Michele Colledan, and *Lorenzo D'Antiga

Tips: Transjugular Intrahepatic Porto-Systemic Shunt

CardioVascular and Interventional Radiology

Published Online: 6 November 2002

Cardiovasc Intervent Radiol (2002) 25:484–493
DOI: 10.1007/s00270-002-1913-6

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Transjugular Intrahepatic Portosystemic Shunts in Children with Biliary Atresia

*Angelo

Peter E. Huppert,[1] Pierre Goffette,[2] Wolfgang Astfalk,[3] Emil M. Sokal,[4] Hans-Jürgen Brambs,[1] Ullrich Schott,[1] Stephan H. Duda,[1] Paul Schweizer,[3] Claus D. Claussen[1]

[1]Department of Diagnostic Radiology, Eberhard Karls University of Tübingen, Hoppe-Seyler-Strasse 3, D-72076 Tübingen, Germany
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[3]Department of Pediatric Surgery, Eberhard Karls University of Tübingen, Hoppe-Seyler Strasse 3, D-72076 Tübingen, Germany
[4]Department of Pediatrics, St. Luc University Hospital of Brussels, Av. Hippocrate 10 UCL 10/29.42, Brussels, Belgium

Tips: Transjugular Intrahepatic Porto-Systemic Shunt

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Transjugular intrahepatic portosystemic shunt creation in children: initial clinical experience.

C A Hackworth, J A Leef, J D Rosenblum, P F Whitington, J M Millis, E M Alonso

Published Online: Jan 1 1998 | https://doi.org/10.1148/radiology.206.1.9423659

Tips: Transjugular Intrahepatic Porto-Systemic Shunt

Minor and major complications are common after TIPS placement and include extracapsular puncture, shunt occlusion and dysfunction, recurrence of ascites or variceal hemorrhage, intraperitoneal hemorrhage, and hepatic encephalopathy.

Tips: Transjugular Intrahepatic Porto-Systemic Shunt

Pediatric Radiology (2019) 49:128–135
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reported no intra- or immediate post-procedural complications as described by the Society of Interventional Radiology guidelines

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STANDARDS OF PRACTICE

Proposal of a New Adverse Event Classification by the Society of Interventional Radiology Standards of Practice Committee

Omid Khalilzadeh, MD, MPH, Mark O. Baerlocher, MD, Paul B. Shyn, MD, Bairbre L. Connolly, MB, MCh, FRCPC, FRCSI, A. Michael Devane, MD, Christopher S. Morris, MD, Alan M. Cohen, MD, Mehran Midia, MD, Raymond H. Thornton, MD, Kathleen Gross, MSN, BS, Drew M. Caplin, MD, Gunjan Aeron, MBBS, MD, Sanjay Misra, MD, Nilesh H. Patel, MD, T. Gregory Walker, MD, Gloria Martinez-Salazar, MD, James E. Silberzweig, MD, and Boris Nikolic, MD, MBA

Tips: Transjugular Intrahepatic Porto-Systemic Shunt

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STANDARDS OF PRACTICE

Proposal of a New Adverse Event Classification by the Society of

Quality Improvement Guidelines for the Reporting and Archiving of Interventional Radiology Procedures

Reed A. Omary, MD, MS, Michael A. Bettmann, MD, John F. Cardella, MD, Curtis W. Bakal, MD, MPH, Mark S. Schwartzberg, MD, David Sacks, MD, Kenneth S. Rholl, MD, Steven G. Meranze, MD, and Curtis A. Lewis, MD, MBA for the Society of Interventional Radiology Standards of Practice Committee

J Vasc Interv Radiol 2003; 14:S293–S295

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And mirroring reported outcomes in the two prior larger series.

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Tips: Transjugular Intrahepatic Porto-Systemic Shunt

CLINICAL STUDY

Check for updates

Technical Feasibility and Clinical Effectiveness of Transjugular Intrahepatic Portosystemic Shunt Creation in Pediatric and Adolescent Patients

Frederic Bertino, MD, C. Matthew Hawkins, MD, Giri Shivaram, MD, Anne E. Gill, MD, Matthew P. Lungren, MD, Aaron Reposar, MD, Daniel Y. Sze, MD, Gloria L. Hwang, MD, Kevin Koo, MD, and Eric Monroe, MD

TIPS creation was successful in 93.4%, hemodynamic success rate was 94%.

Major complication rate was 8.2% (including hemoperitoneum requiring resuscitation and 3 deaths)

Minor complication rate was 21.3%.

Tips: Transjugular Intrahepatic Porto-Systemic Shunt

TIPS creation in children and adolescents is a technically feasible and efficacious procedure with a low complication rate.

Should not only be considered as a bridge to transplantation, but also as an effective and less invasive alternative to surgical vascular shunts.

Conclusion

- *Cirrhosis is a complex process.*
- *In the pediatric population interventional radiology can support diagnosis and treatment of the disease through less invasive and low risk procedures.*
- *To date literature regarding interventional radiology in the setting of pediatric cirrhosis is limited.*

Thank you

Gian Luigi Natali
Interventional Radiology Unit
Pediatric Hospital «Bambino Gesù», Rome, Italy

Bambino Gesù
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