

**Usage and applicability of Cyanoacrilate monomer: further vascular malformations**

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1. Learning objectives

- 1.- To disclose the many and diverse interventional applicabilities of Co-monomer of N-Butyl-2-cyanoacrylate ([\[Glubran®\]](#) [Glubran®](#)) in the vascular and also in the visceral field.
- 2.- To know the technical aspects, tips & tricks
- 3.- To know the cautions that should be taken into account for a proper usage.
- 4.- We present our experience over 125 cases showing different examples

2. Background

Glubran® is a biocompatible acrylic glue with CE Mark. Its former indication was to treat vascular malformations mainly in neuroradiology. Cyanoacrylate is a colourless, water density, high adhesive and radiolucent liquid substance with a characteristic smell and haemostatic and bacteriostatic properties [\[Table 1\]](#) ([table 1](#)). It polymerises in contact with any biological fluid making a solid cast that causes an irreversible occlusion of blood vessels or visceral ducts. Polymerization time lasts 60 to 90 seconds at a temperature of 45°C [\[Table 2\]](#) ([table 2](#)). After an embolization, glue is slowly removed by means of a hydrolytic breakdown process that takes months or years depending on the amount of glue and type of tissue.

We show the advantages and differences with the classical cyanoacrylate (Hystoacril®) and with the new biocompatible liquid embolic agent ethylene vinyl alcohol (Onix®) [\[Table 3\]](#) ([table 3](#)), [\[Table 4\]](#) ([table 4](#)).

3. Clinical Findings/Procedure Details

CLINICAL APPLICATIONS: [\[Table 5\]](#) [Table 5](#)

We have to mix cyanoacrylate with lipiodol to get radiopacity [\[Fig 3\]](#) ([fig 3](#)) [\[Fig 4\]](#) ([Fig 4](#)). We also establish the ratio of glue/lipiodol in order to achieve different polymerization times. Catheter should be flushed previously with a non ionic liquid in order to prevent intra-catheter polymerization [\[Fig 5\]](#) ([fig 5](#)). The kind of catheters required, the way and velocity of injection and glue concentration are exposed and supported through the different cases [\[Table 6\]](#) ([Table 6](#)).

EMBOLIZATION TECHNIQUE: [\[Table 7\]](#) [Table 7](#)

COMBINATION WITH OTHER EMBOLIZATION AGENTS: [\[Group 1\]](#) [Group 1](#)

CLINICAL CASES:

[\[Type III Endoleak\]](#) [Type III Endoleak](#)

[\[Dicoumarin overdose\]](#) [Dicoumarin overdose](#)

[\[Dialysis Access disfunction\]](#) [Dialysis Access disfunction](#)

[\[Angiomyolipoma\]](#) [Angiomyolipoma](#)

[\[Varicocele Sclerosis\]](#) [Varicocele Sclerosis](#)

[\[Hemoptysis\] Hemoptysis](#)

[\[Tumoral Embolization\] Tumoral Embolization](#)

ALSO NON VASCULAR CASES:

[\[Biliary Intervention\] Biliary Interventions](#)

[\[Enteric Fistula\] Enteric Fistulae](#)

4. Conclusion

Glubran[®] has a learning curve but it is a very useful, quick and safe liquid embolic tool when we want to do an irreversible embolization.

Compared with Onyx is very cheap and few materials and devices are needed [\[Fig 6\] \(Fig 6\)](#).

5. References

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6. Mediafiles

Angiomyolipoma



Hipervascular Tumours

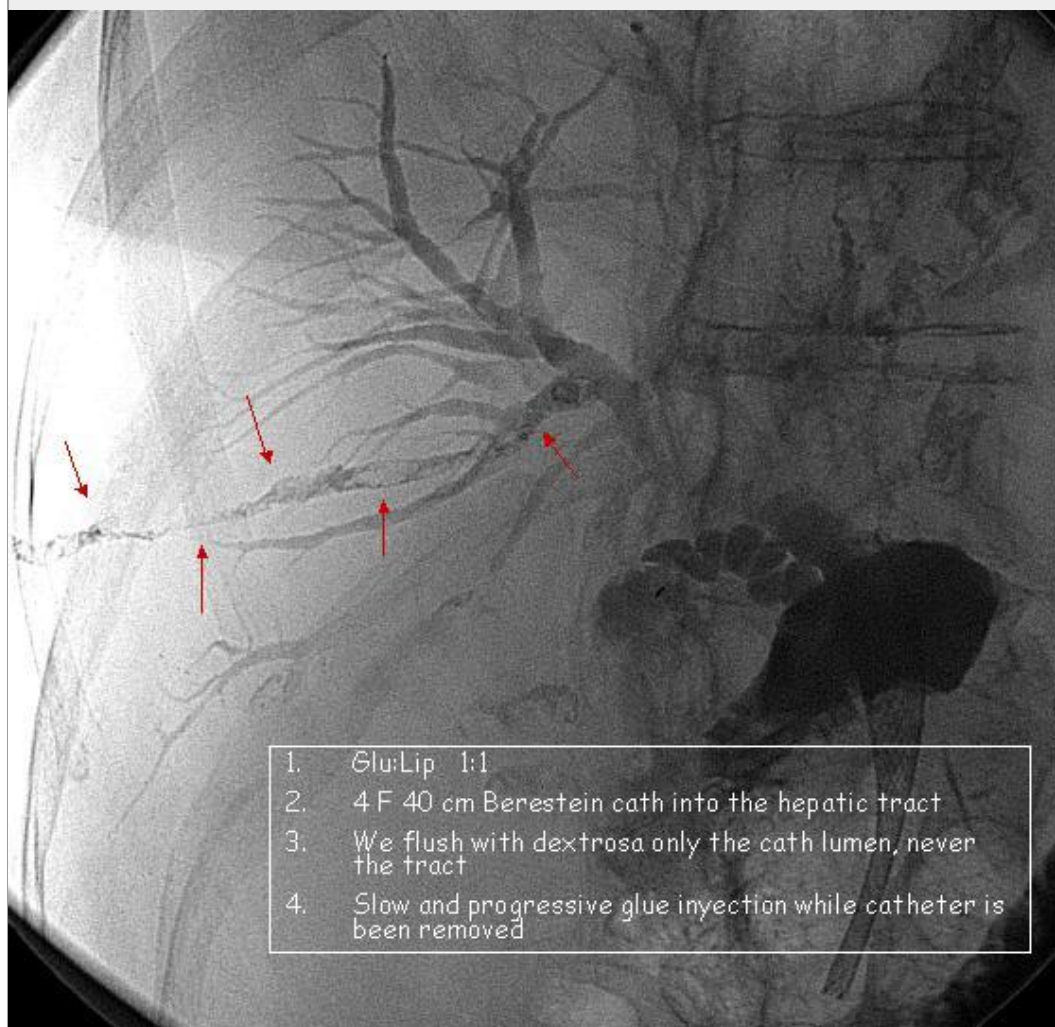
8 cm angiomyolipoma in a 68 ys old woman

Glubran - Lipiodol 1cc:1cc

3 pedicles

- Cobra Glidecath 4F Terumo and 2 microcaths
Masstransit Cordis

Biliary Intervention



*Hepatic tract
sealed after
biliary
intervention*

1. Glu:Lip 1:1
2. 4 F 40 cm Berestein cath into the hepatic tract
3. We flush with dextrosa only the cath lumen, never the tract
4. Slow and progressive glue injection while catheter is been removed

Trans-Tips Embolization of Gastroesophageal Varices with Monomer Cyanoacrylate



- 1.- Cobra Cath Terumo® 4F steady into left gastric vein
- 2.- Perfusion with 20 cc of dextrose 30%
- 3.- Manual injection through a luer-lock 5 cc syringe of 4 cc of glubran+lipiodol mixture at 1:2 ratio

Glue it is very useful for definitive treatment of gastroesophageal varices

Dialysis Access disfunction



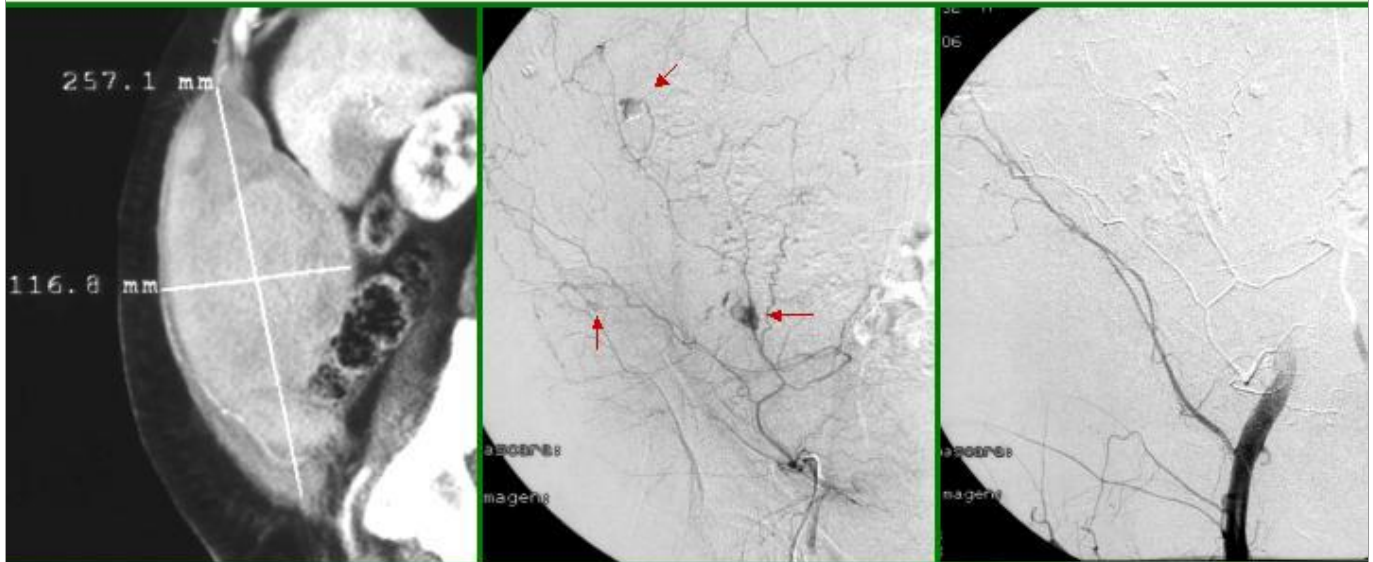
Dialysis access dysfunction because flow steal from a large colateral vein

Selective occlusion with 1 cc Lipiodol + 1cc Glubran

Dicoumarin overdose

Coumarin anticoagulant overdose:

Active bleeding and large hematoma into the anterior abdominal wall



- 1.- Hydrophilic 4F Cobra cath steady into the ostium of the epigastric artery. Flow is blocked
- 2.- Perfusion with 10 cc of 30% dextrose
- 3.- Manual injection through a luer-lock 5 cc syringe of 1.5 cc of glubran+lipiodol mixture at 1:4 ratio

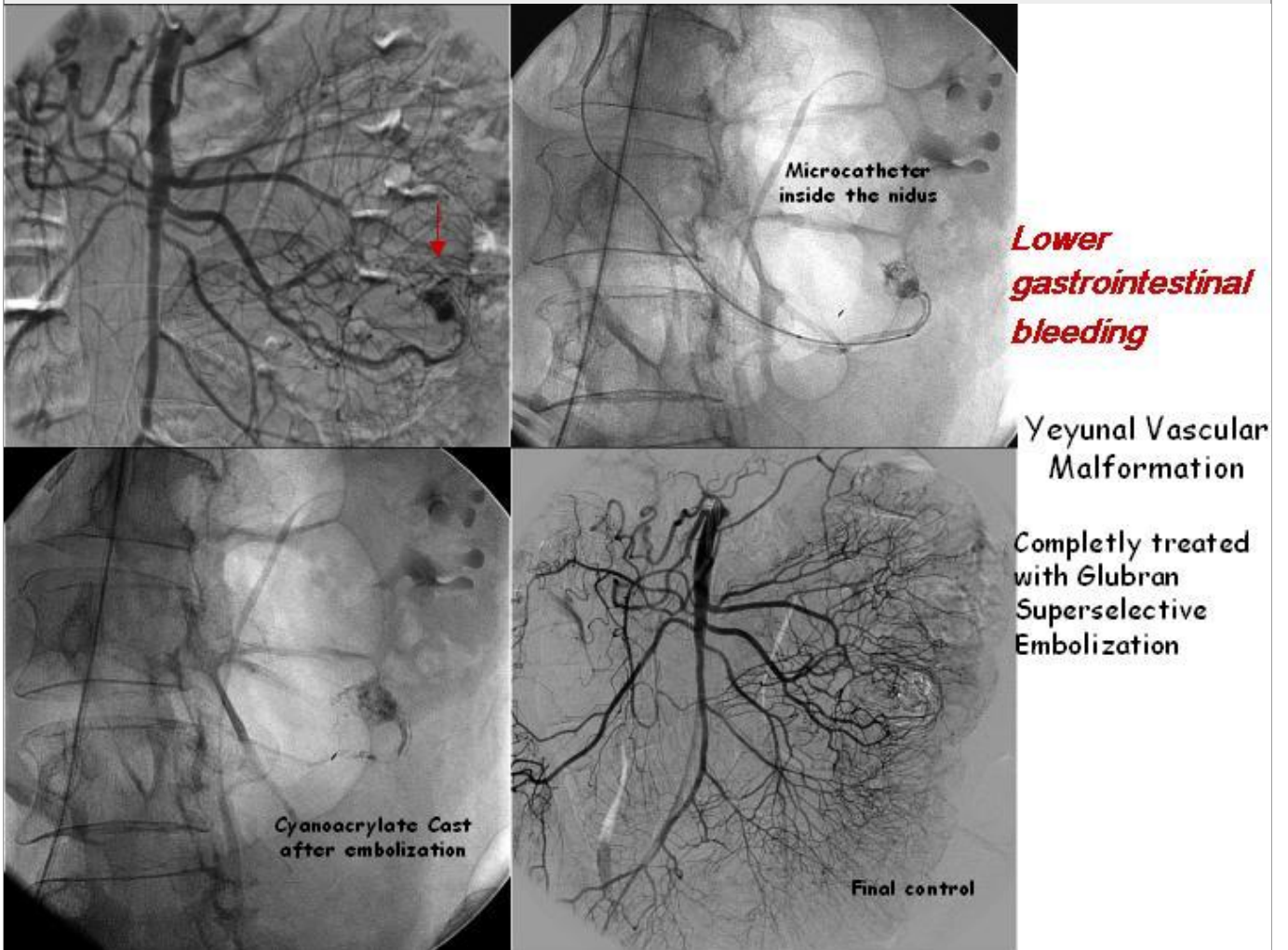
Enteric Fistula



Enterocutaneous Leak

A cast of glue will
fill and close the
leak

Fig 2



Lower gastrointestinal bleeding due to a focal vascular malformation in the small bowel

Fig 3



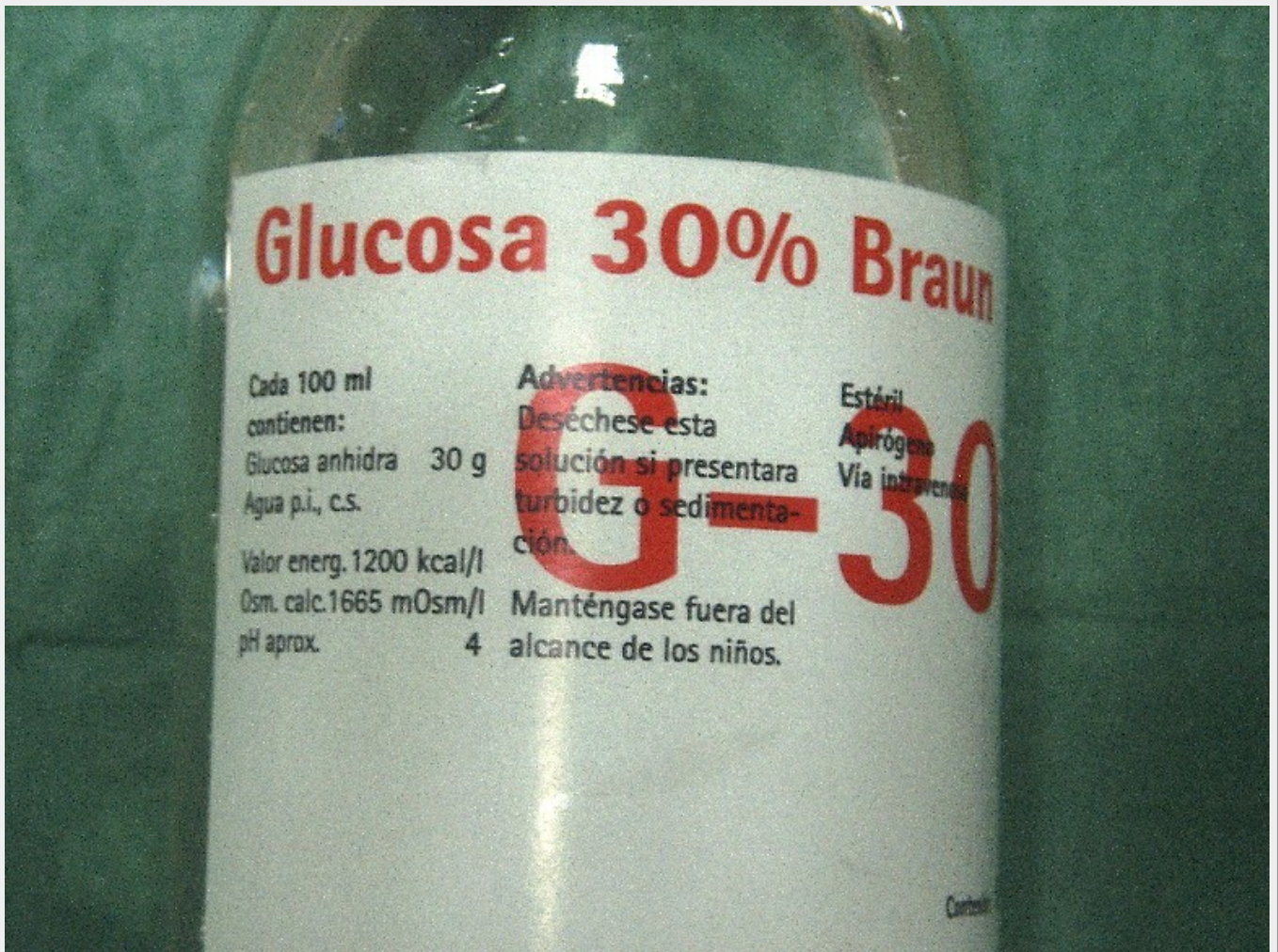
Lipiodol must be mixtured with the glue

Fig 4



By shaking through a 3-way stopcok we mix the lipiodol with the glue

Fig 5



Catheter flushing with a nonionic fluid just before embolization is mandatory

Fig 6



Few and cheap devices are needed for this kind of treatment

Glubran®



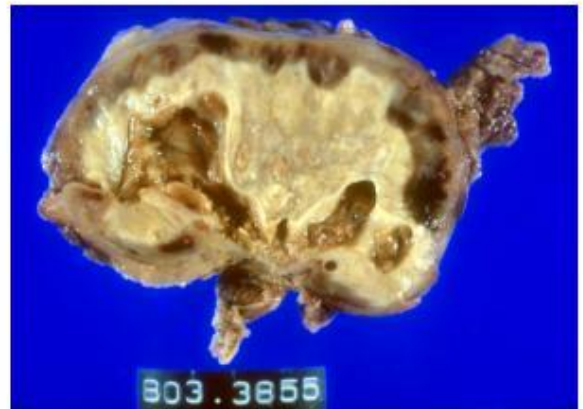
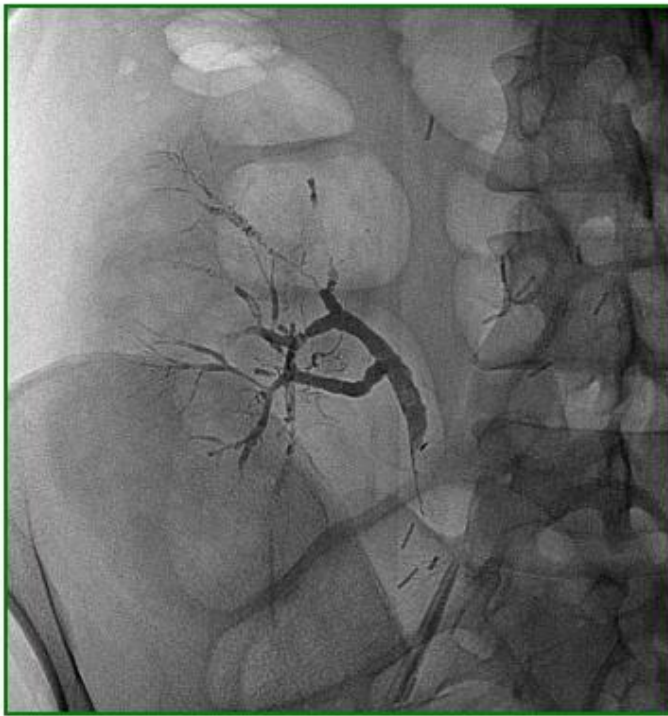
Co-monomer of N-Butyl-2-cyanoacrilate, Glubran®

Group 1

We can combine glue with other embolization agents: coils, Bead-Block, Onix....

Bead-Blocks + Glubran

EMBOLIZATION OF NONFUNCTIONING RENAL ALLOGRAFTS



40 ys old woman
Nonfunctioning renal allograft with chronic rejection. Fever, pain and hematuria lasting 1 month after stopping immunosuppression treatment

- 1- Spheric PVA 350-500 μ
 - 2- Glue : Lipiodol 2:1
- From a hydrophilic 4F Cobra catheter

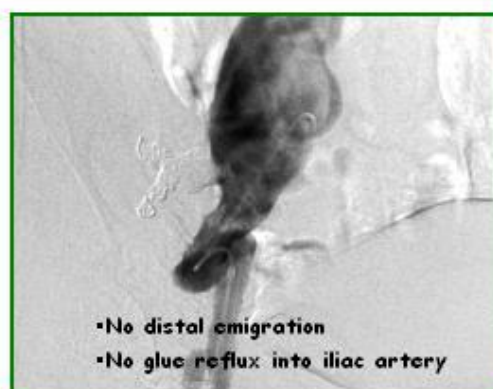
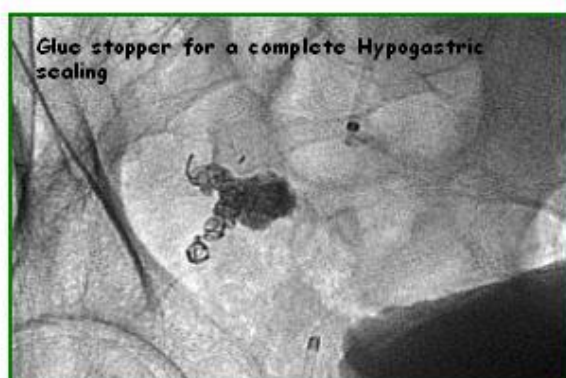
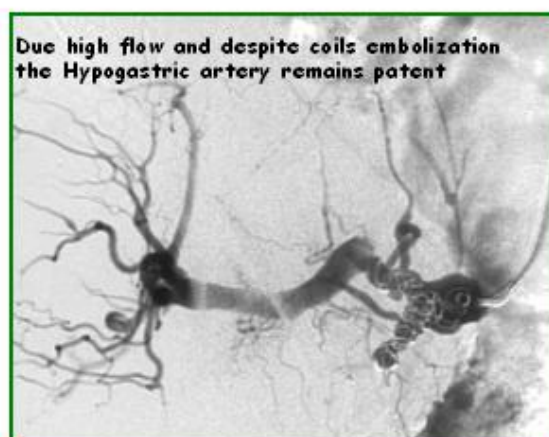
We can combine glue with other embolization agents

Combination with other embolization agents

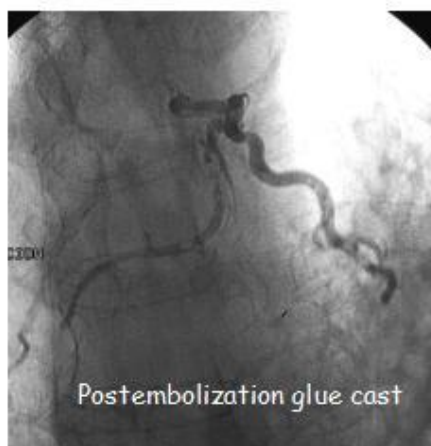
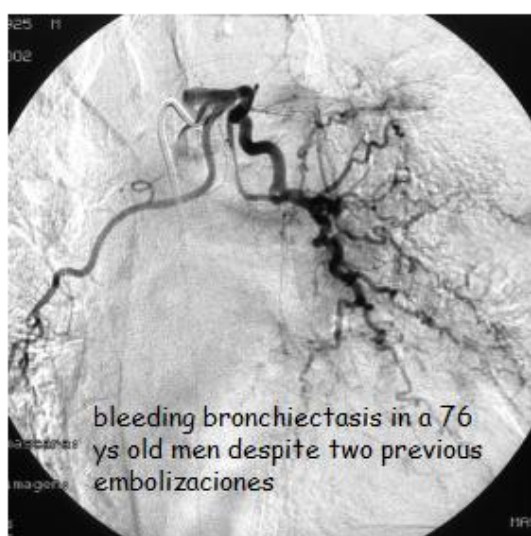
There is no contraindication, and in many cases it is advisable to use before or after Glubran, particles, coils or Onyx ® to supplement or complement the embolization.

Coils + glubran

Hypogastric artery occlusion before EVAR in an Aortoiliac Aneurysm



Hemoptysis



Recurrent Hemoptysis

- 1° Simons 4 F + PVA 500 - 700
- 2° Simons + microcateter Masstransit >>> Glubran 33%
- 3° No rebleeding

Table 1

Glubran Features

- Transparent
- Colorless
- Density similar to water
- Highly adhesive
- Hemostatic
- Dissolving polycarbonates
- Radiolucent
- Typical smell
- Stable in air
- Sclerosant
- Bacteriostatic
- Cold storage

***Polymerizes on contact with any fluid rich
in OH⁻ ions***

(blood, saline, some contrasts ...)



Do not flush the catheter with saline or ionic contrast

Table 2

Polymerization

Polymerization Period:

- It begins 1-2 seconds after contact with blood
- It ends 60-90 seconds after

We can regulate the speed of Polymerization

- It depends on:
 - a)- Lipiodol/glue rate
 - b)- Volume and lasting of the previous flushing with a nonionic fluid either the catheter and vascular bed

We allow the glue once released into the bloodstream about sailing away into distal beds or stay close for achieve a proximal occlusion

Table 3

Glubran VS Hystoacril

- *Advantages of Cyanoacrylate Monomer over Classic Cyanoacrylate*

GLUBRAN

1. Polymerizes at 45°C >>>
2. Polymerizes in 30-90 Seg >>>
3. Flexible >>>
4. CE mark : yes >>>
5. More haemostatic & bacteriostatic effect

HYSTOACRIL

1. Polymerizes at 90°C
2. Instantaneous
3. Friable, stiff, breakable
4. NO (only topical)

Gluebrán has some advantages over the classical cyanoacrylate

Table 4

Glubran VS Onix

- *Both are liquid embolization agents*

GLUBRAN

1. Non controlled release >>>
2. Quick Polymerization >>>
3. Sticks to catheter >>>
4. Very sclerosant and adhesive >>>
5. Non FDA license >>>
6. Chip >>>

ONIX

- Controlled release
- Slow Polymerization
- No sticks to catheter
- Cohesive NO Adhesive
- FDA approved
- Very expensive

Ethylene vinyl alcohol copolymer dissolved in various concentrations of dimethyl sulfoxide (Onix®), is a nonadhesive liquid that have some advantages over Glubran

Table 5

Clinical Applications

- 1.- AVM**
- 2.- Acute hemorrhage**
- 3.- Hipervascular Tumors**
- 4.- Portal vein embolization**
- 5.- Endoleaks**
- 6.- Hypogástric y visceral Aneurysms**
- 7.- Embolization of nonfunctioning renal allografts**
- 8.- Varicocele Sclerosis**
- 9.- Steal colaterals veins in dialysis access**
- 10.- Fallopian tube occlusion**
- 11.- Biliary tracts**
- 12.- Enterocutaneous leaks**

Clinical Applications

Table 6

Instructions for Use

CATHETER

1. **Either Usual 4 F cath or Microcatheter can be used**
2. **Cath previous flushing with a nonionic fluid is mandatory (10% or 30% dextrose, glucosmon, distilled water)**
3. **Cath become useless after embolization**

MIXING WITH LIPIODOL

1. **It makes the mixture radiopaque**
2. **Modulates the rate of polymerization**

INJECTION

1. **Slow and regular. Always kept under strict fluoroscopic control**
2. **No rush with catheter withdrawn, we can wait some seconds**
3. **Pull quickly of the catheter after getting your goal**

How to use the glue

Table 7

Technical aspects, tips & tricks

technique 01.jpg

Embolization Technique

1. **Stable catheter into the target vessel**
2. **Very detailed previous angiographic** (colaterals & potencial non target embolizations vessels...)
3. **Guiding Catheter: is not essential**
4. **We must calculate the *volume, concentration and velocity* of the final glue injection by doing previously several manual inyections with contrast**
5. ***Lipiodol & Glubran mixture*: Immediately before injection both are shaken into luer locked syringes through a 3-ways key**
6. **Finally, the mixture is injected from the catheter**

Embolization Technique

For Distal beds occlusions: (we need the glue to get away)

- Lipiodol:Grubran Rate > 3 3:1, 5:1
- Generous flushing with dextrose not only the catheter but also into the vascular bed

For Proximal occlusions: (it should be equivalent to a coil embolization)

- Lipiodol:Grubran Rate 1 1:1
- Flush with dextrose only the catheter lumen

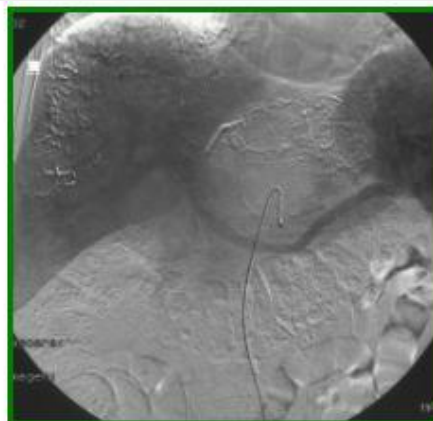
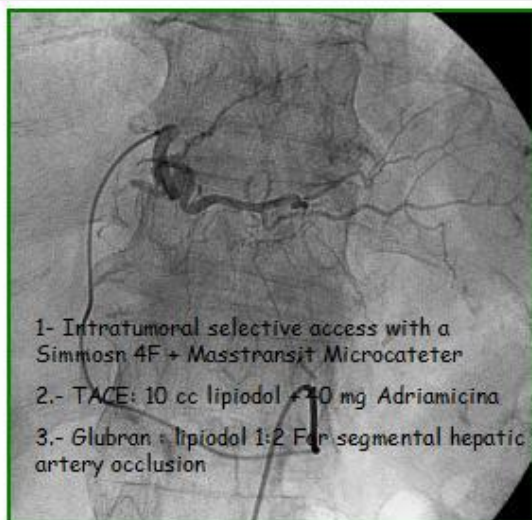
For very high flow: (risk of unwanted distal migration of the glue)

- If we deploy one or more coils before, glue will stop at contact with them
- Concentrated mixture and low flushing

For Stopped flow: (narrow artery, occlusive catheter or arterial spasm)

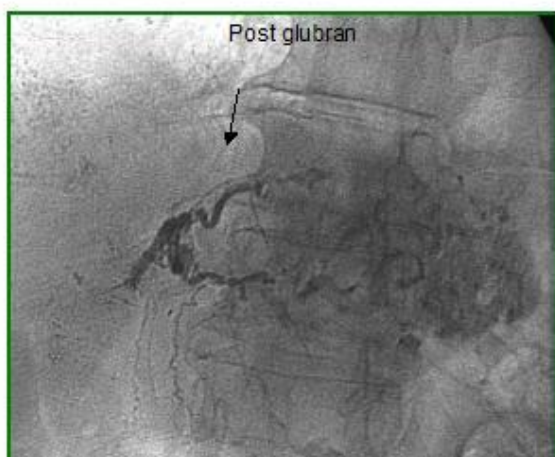
- If distal embolization is desired : Flush profusely and replace blood with dextrose
- If proximal embolization is desired : Flush with dextrose only the catheter lumen

Tumoral Embolization

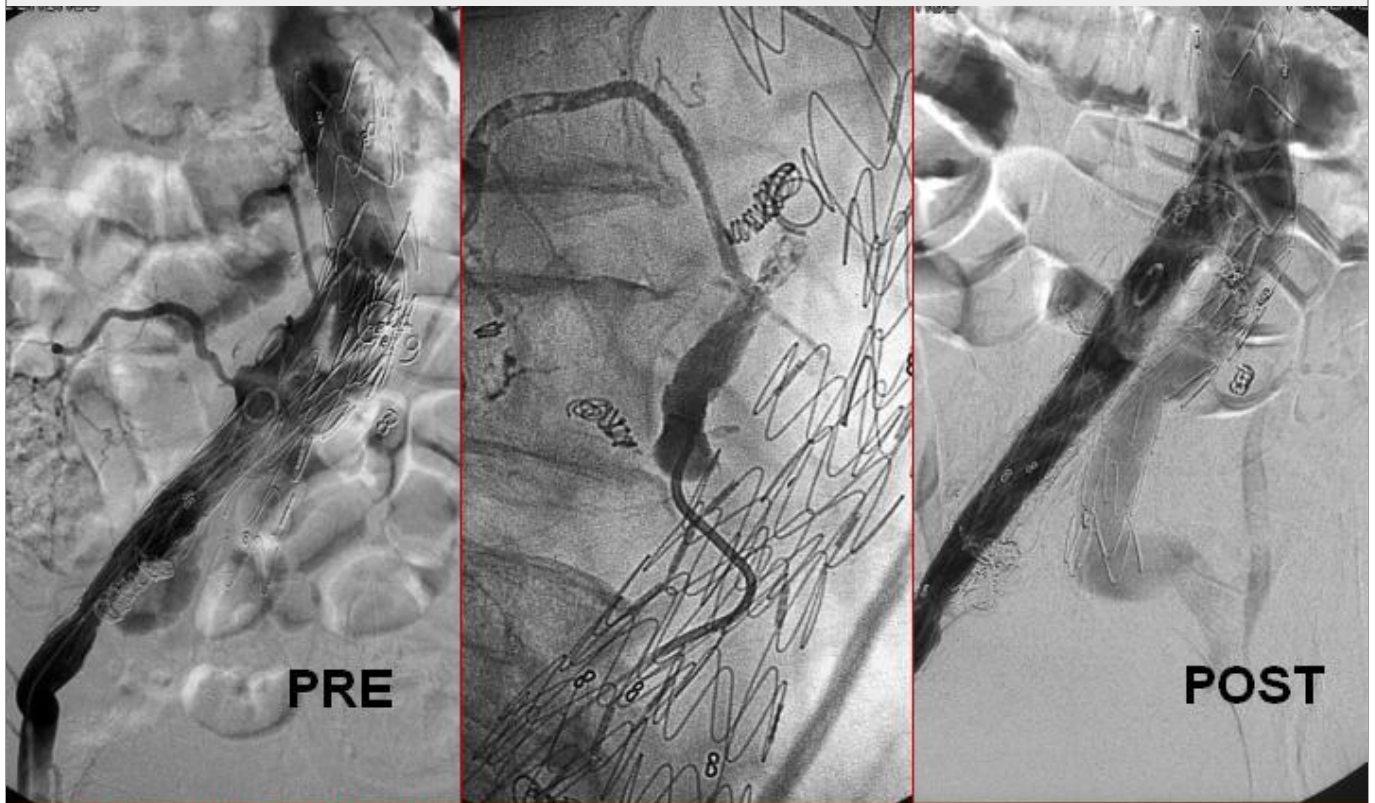


TUMORAL EMBOLIZATION

Non surgical 9 cm HCC which extends over much of the left lobe in a 75 HCV+ ys old man



Type III Endoleak



Type III Endoleak

Aneurysm sack expansion 2 ys after EVAR : there is tear in the dacron

- 1.- The leak is filled with Glubran (3 cc glubran+lipiodol 1:1 ratio through a 4F Simons Cath)
- 2.- A coaxial iliac stent-graft extension was deployed at the tear site

Varicocele Embolization



14 ys old boy

Symptomatic grade III varicocele (pain)

- 1.- 4F cobra into left spermatic vein
- 2.- Glubran 1cc + 1 cc lipiodol > Slow and regular injection under strict fluoroscopic control