

---

---

## Transjugular Renal Biopsy

A. Meyrier

Broussais-Georges Pompidou Hospitals, (University Paris-Descartes, Faculté de Médecine), Paris, France

---

---

Transjugular liver biopsy was described in 1964. The hepatic veins open into the vena cava almost vertically. It is easy to introduce a catheter through the right jugular vein down to the hepatic veins and let it guide a long rigid needle to sample a fragment of liver tissue, under aspiration, according to the Menghini technique [1]. Considering that liver disease entails a risk of bleeding, and that its capsule is far from the needle tip, the liver will bleed back into the circulation. In 1989 Drs Frédéric Mal and Patrice Callard undertook a study on cadavers that concluded to the feasibility of TJRB and led to designing a set comprising a needle shorter than that used for sampling liver tissue. The biopsy set designed in 1990 and manufactured by William Cook-Europe, Bjaeverskov, Denmark, consists of a modification of the Colapinto liver biopsy set. The catheter is 62.5 cm long, gauge 9 F (2.97 mm), precurved at 45°. The needle length is 63.8 cm, gauge 15 G (1.84 mm) with a reverse bevel at 45°. The needle throw length does not exceed 13 mm. This set has been used since and is the most appropriate to that purpose [2-4]. Different material has been used by others. It is inadequate and may be dangerous [5].

### Procedure

The patient is mildly sedated 30 min before the procedure and placed in supine position on the radiology table. The right internal jugular vein is localised by ultrasonography and punctured under local anesthesia. A wire guide is inserted into the vena cava under radiologic control and leads the catheter that is wedged into the lower pole of the right kidney. Its position is checked with two ml of contrast medium. The biopsy needle is filled with saline, inserted along the sheath and connected to a syringe filled with saline. The needle is briskly pushed and withdrawn under continuous vacuum aspiration. The renal tissue sample is flushed out of the needle, or the syringe, and occasionally the catheter.

The procedure can be repeated to obtain tissue for immunofluorescence. This second pass is also guided by phlebography with a few ml of contrast medium. Considering that repeating passes into the same venous branch progressively drills a channel that gets closer to the renal capsule, it is advisable to change the orientation of the catheter and to avoid as much as possible more than 3 passes. When appropriate, the renal biopsy can be followed by a liver biopsy with the same material

Transjugular renal biopsy (TJRB) cannot be considered a routine procedure, for reasons of personnel, time and cost. It requires an experienced operator, vascular radiology equipment for about 30 min, and the Mal-Renal biopsy set costs 140 € + VAT. Considering the poor background of the patients in whom TJRB is deemed advisable, a vascular radiologist should be available in case of severe hematuria and/or perirenal haematoma to perform embolization.

### Indications

The major indication of TJRB is represented by the renal patient with a bleeding disorder, or treated with anticoagulants, in whom renal histology is mandatory for diagnosis and treatment options. This is usually the case in liver disease, and the technique has the advantage of allowing simultaneous renal and liver tissue sampling. The patient treated with respiratory assistance and/or necessity for artificial kidney procedures under heparinization can only be biopsied by TJRB. Voluminous ascites also precludes the prone position. Uncontrolled hypertension is a third possibility. Morbid obesity may require to biopsy the right kidney via the renal vein.

The cirrhotic with clotting disorders is the patient of choice for TJRB. The rationale for performing renal biopsy, especially when liver transplantation is considered is based on the various etiologies of renal insufficiency in the cirrhotic. Renal disease may result from the hepatorenal syndrome, from moderate renal lesions, such as IgA deposits, from developing lesions, an example of which is severe post-infectious GN and the biopsy may discover some form of end-stage renal disease. Renal histopathology is therefore essential to decide among liver transplantation, liver + kidney transplantation, or no transplantation.

In Jouet et al report [6] the renal biopsy results influenced the strategy regarding transplantation as follows: carry out liver transplantation in 8, combined renal and hepatic transplantation in 5, refuse transplantation in 2 and modify the medical treatment in 6.

### Complications

In a personal experience based on our first 200 cases [4] six minor perirenal hematomas were detected by systematic ultrasonography. Fourteen patients had a macroscopic hematuria. Transfusions were necessary in four cases of perirenal hematoma and one of abundant hematuria. This rate of significant bleeding (2.5 %) is small, comparable to that of the conventional percutaneous approach, which according to series and material used may represent 4 %. This is especially true considering the high risk background of our cohort.

In 2000, Cluzel et al [7] undertook a large study to compare the effectiveness and safety of 400 transjugular renal biopsy procedures using the Cook Mal-Renal biopsy set with those of 400 percutaneous renal biopsies using the Bard 'biopsy gun'. The patients in the TJRB subset were mostly selected (303/400, 75.8 %) according to a bleeding disorder. A majority in each subgroup suffered from primary GN, vascular nephropathies, tubulointerstitial nephropathies and lupus nephritis. The yield of renal tissue and the incidence of major complications were the same in both groups.

### Experience from other investigators

Mal et al' publications were followed by a few reports dealing with isolated cases or 'preliminary experience'. A current Medline search yields few large series, save for the foregoing

cited above and for Rychlik et al [8] who published in 2001 on 67 cases. However some recent papers seem to rediscover the transjugular route of renal biopsy and must be considered with more than reservation.

A short American case series [9] reported 10 procedures in 9 'high risk patients', including an 88 years old man with myeloma and AL amyloidosis who died of sepsis following the procedure. Another case was that of a diabetic with nephrotic syndrome in whom 8 passes yielded 8 glomeruli at the expense of capsular perforation and gross hematuria. All patients but one suffered capsular perforation requiring Gelfoam pledget hemostasis. Gross hematuria occurred in 6/10 biopsies. The material used was a side-cut QuickCore needle with a 20 mm throw length. Another report from Britain presented the results of TJRB using a side-cut needle in 25 cases [10]. The procedure yielded renal tissue in 23/25 cases, with zero to 32 glomeruli for light microscopy. There were 17/23 capsular perforations requiring embolization in six.

### Recommendations

The renal cortex is thinner than the liver mass. This is especially true in chronic renal insufficiency, with the exception of diabetic nephropathy, renal amyloidosis and the rare case of renal involvement in lymphoma. Ultrasound examination provides useful information on the cortical thickness and occasionally discloses a solitary kidney, or an equivalent in the form of a small atrophic kidney. It is clear that 2 passes using a needle with a 20 mm throw length will perforate the capsule, irrespective of the orientation of the catheter wedged in a small peripheral renal venule. This is why the needle tip should not exceed 13 mm, and the reason for the high rate of complications found in the foregoing reports. Also, repeating passes in the same site drills a channel that gets increasingly close to the renal capsule. The original Menghini technique for liver biopsy was based on continuous vacuum aspiration during the whole procedure. The tissue fragments so obtained are often small but the yield is high and the risk is low. Conversely it appears that side cut needles are not fit for vacuum based sampling.

A number of investigators base the safety of the transjugular approach on the idea that capsular perforation is rare, whereas it is by definition constant with percutaneous renal puncture. They also consider that the blood extravasation returns to the patient's own circulation. It follows the contention that in case of bleeding (be it in the form of a perirenal hematoma or of significant hematuria), a Gelfoam pledget will be easily plugged by means of the biopsy set catheter and stop bleeding. In fact, even when the needle throw length is short and the operator able, capsular perforation is not uncommon, as shown by systematic ultrasound examination. The ensuing hematoma, however, is usually small, because perirenal fat limits the bleeding. This is especially true in obese patients, whose perirenal fat thickness may exceed 2 cm. [11]. Conversely, renal capsule perforation from outside allows extravasation through the channel drilled by the biopsy needle. The notion that bleeding can easily be stopped by a plug flushed into the venule where the catheter had been wedged is false.

Significant bleeding does not originate from a vein, in which the hydraulic pressure is in the order of 3 mmHg but from a renal artery, even as small as an afferent glomerular arteriole, in which the blood pressure is in the order of 120 mmHg. In case of serious perirenal hematoma and/or hematuria, the only recourse is to carry out selective arteriography and plug an artery, not a vein.

### Conclusion

To this day more than 1800 procedures have been carried out in Paris and hundreds elsewhere. Both the right and the left kidney are available to this mode of renal tissue sampling in high risk patients. With expanding experience the rate of complications does not exceed that of the percutaneous approach. However these encouraging results imply that the operator heed simple principles regarding the procedure he follows and the material he uses.

### References

1. Lebrech D, Degott C, Rueff B, Benhamou JP. Transvenous (transjugular) liver biopsy. An experience based on 100 biopsies. *Am J Dig Dis* 1978;23:302-304
2. Mal F, Meyrier A, Callard P et al. Transvenous renal biopsy: a preliminary report on 36 patients. (Abstract) *Kidney Int* 1990;37:279
3. Mal F, Meyrier A, Callard P et al. Transjugular renal biopsy. *Lancet* 1990;335:1512-1513
4. Mal F, Meyrier A, Callard P, Kleinknecht D, Altman JJ, Beaugrand M. The diagnostic yield of transjugular renal biopsy: experience in 200 cases. *Kidney Int* 1992;41:445-449
5. Meyrier A. Transjugular renal biopsy. Update on hepatorenal needlework. *Nephrol Dial Transplant* 2005 in press.
6. Jouet P, Meyrier A, Mal F et al. Transjugular renal biopsy in the treatment of patients with cirrhosis and renal abnormalities. *Hepatology* 1996;24:1143-1147
7. Cluzel P, Martinez F, Bellin MF et al. Transjugular versus percutaneous renal biopsy for the diagnosis of parenchymal disease: comparison of sampling effectiveness and complications. *Radiology* 2000;215:689-693
8. Rychlik I, Petryl J, Tesar V et al. Transjugular renal biopsy. Our experience with 67 cases. *Kidney Blood Press Res* 2001;24:207-212
9. Abbott KC, Musio FM, Chung EM, Lomis NN, Lane JD, Yuan CM. Transjugular renal biopsy in high-risk patients: an American case series. *BMC Nephrol* 2002;3:5-11
10. Thompson BC, Kingdon E, Johnston M et al. Transjugular kidney biopsy. *Amer J Kidney Dis* 2004;43:651-662
11. Fine DM, Arepally A, Hofmann LV, Mankowitz SG, Atta MG. Diagnostic utility and safety of transjugular kidney biopsy in the obese patient. *Nephrol Dial Transplant* 2004;19:1798-2002