Transjugular Renal Biopsy

Kendal Redmond
Princess Alexandra Hospital
ANZSIN Sept. 2013
TJRBx : Introduction

- Percutaneous renal Bx first described by IVERSEN and BRUN, 1951
- Subsequent significant improvements in equipment and image guidance.
  - (Associated with a recognized clinically apparent complication rate of up to 3.5% and perirenal haematoma b/w 57-85%)
- There are recognized group of patients who will benefit from a histological diagnosis but in whom Perc. Renal Bx poses an unacceptably high risk. (estimated at up to 7% in clinical practice)
TJRBx : Introduction

- **1989; Dr Frederic Mal** performed a TJ Liver Bx at Jean Verdier Hospital (France) and received a pathology report from **Dr Patrice Callard** describing a sample of renal tissue. (Biopsied patient having an “uneventful course”).

- Mal and Callard collaborated on a Cadaver study to assess the feasibility of TJRBx.
  - Performed procedure on tot. 5 cadavers initially with the standard 15g COLAPINTO needle (COOK) which had been safely used for TJLBx since 1964.
  - They redesigned the needle to limit risk of capsular perforations evident when using the standard COLAPINTO needle. (Limiting needle protrusion from catheter to 13mm).
TJRBx : Introduction

- 1990; They presented their initial data in a poster at the annual meeting of the American Society of Nephrology.


- This same group followed with, Transjugular Renal Biopsy in Lancet 1990 v335, issue 8704, p1512-1513. Discussing TJRBx results from there first 50 patients. Obtaining specimens of renal tissue in 44. (Glomeruli in 38/44) and no major Cx. (Patients all followed with USS within 18hrs) (Minor Cx, incl. Mild Transient R) lumbar pain, Transient macroscopic haematuria, asymptomatic perirenal haematoma).
A novel technique to obtain renal biopsy specimens from patients in whom percutaneous renal biopsy is contraindicated is described. After adaptation of equipment used for transjugular liver biopsy, 50 such patients underwent transjugular renal biopsy: specimens of renal tissue were obtained from 44 patients, and glomeruli were found in 28 specimens. No major complications were observed and histological examination of the biopsy specimens led to change diagnosis or management in 13 patients. Transjugular renal biopsy should be considered when percutaneous biopsy is contraindicated or has failed.

Lancet 1990; 336: 182-183

Introduction

Examination of renal biopsy specimens is the cornerstone of diagnosis in most pathological renal diseases, and may be essential to decide the most appropriate treatment. In rapidly progressive glomerulonephritis, for example, renal biopsy allows one to establish the glomerular basement membrane may indicate a need for emergency plasma exchange; and unexpected disease such as monoclonal gammopathy, may be readily diagnosed by the renal pathologist.1 Such specimen s are usually obtained by percutaneous puncture of the kidney, or, occasionally, by open biopsy.2 Percutaneous renal biopsy is an established technique which is completely safe when the patient has normal blood pressure and no bleeding disorder, and when the kidneys are not too small (3 cm) in diameter. However, when the conditions are not met, percutaneous renal biopsy may be complicated by perirenal haematoma or even haemorrhage that requires surgery. In some patients this risk may be considered unacceptable high, even when histological examination of kidney tissue would influence diagnosis and treatment—as, for example, in a patient with acute renal failure and haemorrhagic uraemic syndrome with severe thrombocytopenia.3

Transjugular liver biopsy is a safe procedure in patients with severe bleeding disorders.4 Very occasionally, in the course of such a biopsy, we have obtained renal tissue by indirect puncture of the right renal vein, rather than a hepatic vein. Such renal samples were considered suitable for histological examination, and the patients suffered no complications. This prompted us to do a preliminary study on cadavers to determine whether modifications of transjugular liver biopsy equipment were needed to facilitate biopsy of the right kidney. We used the modified equipment for transjugular renal biopsy in 50 patients in whom histological examination of renal tissue was considered necessary for diagnosis or treatment decisions, but conventional percutaneous renal biopsy was contraindicated.

Patients and methods

The procedure was tested in 5 cadavers with normal sized kidneys. A vessel dilator was introduced into the right intercostal vein, and a 18 French (2.76 mm) sheath for transurethral liver biopsy (Wilson Cook, Bloomington, Indiana) was inserted under visual and manual control into the right renal vein and guided into the lower pole of the kidney. A liver biopsy needle was advanced to the tip of the catheter and a renal tissue sample was taken. Subsequently, examination of the kidneys showed that the capsule had been performed, the equipment was therefore modified. The final version had a catheter length of 125 cm, gauge 9 French (2.5 mm), exposed at 45° and a needle length of 6 mm (gauge 18 French (1.8 mm), with a reversed bevel at 45°. The study was approved by the local ethics committee and all informed consent was obtained before the procedure. 50 patients were studied, all of whom had a definite indication for renal biopsy. 18 had a serum creatinine concentration above 200 mmol/L. Transjugular biopsy was preferred to percutaneous biopsy because of one or more of the following reasons: 18 required both liver and renal biopsy specimens; 17 had severe clotting disorders; 2 had severe nephrotic syndrome; 3 had anuric type hypertension; 3 had morbid obesity; and 2 had a solitary right kidney. In 7 patients at least one attempt at conventional percutaneous biopsy had failed.

Discussion

The transjugular route has been used for thousands of liver biopsies since its description in 1964—mostly in patients with bleeding disorders who constumeed transportational biopsy.4 Even when used in severely ill patients, morbidity and mortality rates for this technique are extremely low because the blood regresses the circulation. We have found that transjugular renal biopsy is also feasible, with slightly modified equipment, in such patients. Catheterization of the right renal vein was usually easy, even in a few patients with unusual renal vein anatomy. The duration of the procedure was usually uninconceivable in the view of the patient population in whom conventional percutaneous biopsy was contraindicated, and no serious complications were observed.

Was renal biopsy in such patients worthwhile? In 13 patients the specimens obtained with this technique confirmed the original diagnosis, or led to a material change in management (in that enlarged) in particular, 10 patients with cardiac and severe bleeding disorders were found to have 14 glomerulopathies, and in 49-year-old lady with nephritic syndrome was found to have AA amyloidosis. Percutaneous renal biopsy was not the question of all the patients. Nevertheless, in the context of such a view, the approach to patients with severe bleeding disorders and the approach to patients with severe bleeding disorders for renal biopsy should be considered in patients for whom transcutaneous renal biopsy is contraindicated but histological examination of renal tissue is likely to influence diagnosis or management.

We thank Mrs Dowd for her secretarial assistance.

REFERENCES


Modeling and simulation of the Australian health care system.

In the summer of 1948 the British and Australian Thrombosis Society agreed to monitor training opportunities in each other’s country and to report back on these opportunities for travel by medical students.

15. A change of scene

Hull to Sydney

As a newly appointed senior registrar in Hull, with applications for consultant posts due, I thought the time was right to see how things were done in Australia. I received warm support from my senior colleagues and the regional health authority, and wrote a script and a programme for an epidemic of nephritis as it has been seen in the Australian Jewish high volume centre in Manchester, for which I was to present in the UK. The programme was a mixed experience of Australian life. In general I found the standards of medical and nursing excellence at the level of the teaching centres in which I have worked in the UK. The only difference between the UK and Australia is how medicine is organized and paid for. In some ways Australia is where we are three or four years in advance in realising that providing high technology medical care is one thing, but paying for it is another.

There are three main sources of funding for medicine in Australia—the Federal Government, who fund the Medicare_scheme, the States, who fund the public hospital systems and private insurance companies. Medicare acts as a purchaser (introduced by a Labor government in 1971) where every income was used to fund a public health service. Predictably there was not enough money and more than 4% of the budget was surplus of the working population. When a patient

Viewpoint

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TJRBx: Introduction

- This summarised data from 195p all with uss f/u within 24hrs.
- Bx performed with modified Colapinto needle and intended max.3 passes, (4 in 15p).
- Renal tissue obtained 88% (176/200)
- Diagnostic tissue in 83% (Av. Glom. 10). (range 1-35)
- Uneventful outcome 90% (179/200)
- Clinically silent perirenal haematoma 3% (6/200)
- Clinically significant haematomas 2% (4/200). 3 (TFused) 1.5%
- Macroscopic Haematuria 15/200. 7.5%, Transient 14, 1 (TFused)
- TOTAL Major Complication 2.5% (2% needing transfusion).

(2005 Nephrology Dialysis Transplant article Alan Meyrier, describes Cx from last 200 TJRB at Jean Vernier Hospital performed as “virtually nil”).
TJRBx : Introduction

- These initial reports were supported in a 2001 article from Rychlik et al. from Prague who reported on their experience in performing TJRB in 67 patients between 1993-1999.
- Renal Tissue obtained in 79%, Diagnostic in 92% of samples.
- 2000, RADIOLOGY June 2000 215 689-693
  Phillipe Cluzel et al. (Paris) published, “TJ versus perc. Renal Biopsy for Dx. of parenchymal disease. Comparison of sampling effectiveness and complications”.
TJRBx : Introduction

- Discussing results and complications of 400 consecutive TJRB performed b/w Nov 1993 and Dec. 1998 (Using modified Colapinto needle, Mal Transjugular renal Bx set. (COOK)).

- Compared retrospectively with 400 perc. Renal Bx performed during same period.
TJRBx : Introduction

Perc renal Bx.
- 360 “blind” pre marked, 40 image guidance.
- Renal tissue obtained 95.5% Mean gl LM 11.2, IF 6.4
- Dx. Adequate specimen 98.2%
- Major Cx. 3p (0.75%). 2 AVF, haematuria, embolised. 1 inadvertent splenic Bx. (splenectomy).

TJRBx.
- Biopsy in 397/400. (2 recurrent renal v. 1 thrombosed renal v.)
- 75.5% 303p with bleeding disorder
- 13 Left renal Bx.
- Renal tissue obtained in 95.8% mean gl LM 9.8, IF 4.6
  (additional Bx, myocardium 14 and liver 35
- Dx. Adequate specimen 98.2%
- Major Cx 4p (1%). 1 IJV haematoma (t/f), 3 perirenal haematomas,(2 emb.1t/f)
1. Modified Colapinto Needle, Menghini Aspiration Technique

- 9fr 62.5cm long catheter 45deg precurved tip advanced from R)IJV to renal vein, wedged into posterolateral interlobar medullary vein. Small contrast injection then advance 15g Modified Colapinto needle primed with saline through the catheter and advance forcibly beyond it’s tip then aspirate as the needle is withdrawn. (Catheter and needle Designed to only advance 13mm beyond catheter tip). Menghini 1 second Aspiration Technique.
Fig. 1. Right renal vein phlebography carried out at the time of transjugular renal biopsy. This photograph shows the catheter wedged into the lower pole of the right kidney. The oblique, and sometimes almost vertical course of this vein is favorable to the insertion of the hardly flexible biopsy needle. This would not be feasible on the left side. The insert depicts the course of the catheter from the jugular vein to the right kidney.

Radiograph of a right kidney after the injection of contrast medium into the venous system shows a wedge of enhanced cortical parenchyma (arrows) before puncture.
Fig. 1. Three-dimensional computed tomography of a normal kidney. The cortical thickness varies almost 2-fold according to the site of biopsy. Note that fairly large renal arteries are close to the biopsy needle tip. In this case, repeating passes into the lower site would entail a high risk of drilling and perforation. Likewise, a 20 mm throw length needle would almost invariably perforate the capsule. Courtesy of Christiane Strauss MD, Radiologist, Institut Mutualiste Montsouris, Paris.
TJRBx: Comment on Technique.

2. Alternative Biopsy Technique.
(Side Cutting quick core Biopsy Needle (2cm throw))

- “Blunt tipped” 60cm length 19g (or 18g) core biopsy needle. 2cm throw.
- Number of authors have published smaller case series of TJRB performed using this needle.
- Abbot et al. BMC Nephrology 7/2002. 9p, Walter Reed Hospital. Dx tissue 100%, capsular perf. 90%. No Major Cx.
- Thompson BC et al. (init. Poster annual meeting of Am. Soc. of Neph. and Abstract CVIR Nov. 2002). Then published AJKD April 2004 (v43, issue 4 p651-662)
  - TJRB side cutting needle, 25p. Mean 3.5 cores.
  - Renal tissue 23/25. Dx. 21/23 (91.3%); Mean glom. (LM) 9.9.
  - Capsular perf. 17/23, (73.9%) 
  - 2 major Cx. (4%). 1 arteriocalyceal fistula, embolised. 1 renal v thrombosis.
TJRBx: Comment on Technique.

2. Alternative Biopsy Technique.
(Side Cutting quick core Biopsy Needle (2cm throw))

- **See T.C, Thompson BC etal (Cambridge), CVIR 2008:** TJRB: “Our experience and technical considerations”
- Retrospective R/V of 59p using Quickcore Bx needle
  - **Dx. Specimen** 56/59 (95%)
  - Mean Glom. No. (LM) 10.3, (IF) 2.6
  - Isolated capsular perf. 33%
  - Contained subcaps leak 18%
  - **Major Cx 12.5%**. (7p, 5 transfused, 1 Arterio Calyceal Fist. (embol.) 1RV thrombosis.
  (incr. risk capsular perf. > 6 cores)
TJRBx : Comment on Technique.

2. Alternative Biopsy Technique.
(Side Cutting quick core Biopsy Needle (2cm throw))

- **Misra S et al., JVIR Apr. 2004 19(4) 546-51;**
  “Safety and Dx yield using the quick core Bx method in high risk patients.”
- Retrospective review at Mayo clinic (Rochester) of 39 patients with F/U imaging in 25/39. All with pre/post LABS
- **Tech. success 38/39 (97%)**
- Mean Core No. 1.8. Glom. No (LM) 5, (IF) 2.1
- **Dx. 92%**
- **Major Cx 2.6%, Minor Cx 52%.** (mainly perirenal haematomas) (and small No. CIN).
- **IMAJ V13 July 2011 (Israel)** similar findings in report of TJRB in 12 patients. (Tech. success 11/12. Dx. 11/11 (100%). Minor Cx. 2/12.
alternative biopsy technique. Why?

- Smaller needle allowing a more peripheral sample (but at expense of capsular perf. But usually not clinically significant)
  - (Marchetto et al. JVIR 1997. Increased glomeruli/specimen with capsular perforation).
- Fewer passes for Dx. Specimen. (Larger tissue specimens with reduced fragmentation.
- Technique easier to learn/Teach.
- (Reduce risk with technique modification, ie. Limit the throw to less than 13mm as in original descriptions)
TJRBx : Overall Review

- Overall published literature. For TJRBX independent of method.
  Technical success approx. 92%
  Dx specimens obtained 94-100%
  (overall Dx. Success 89-97%)
TJRBx: Indications

- (Not an alternative to percutaneous renal Biopsy but to be utilised when percutaneous Biopsy unable to be safely performed)
- **Bleeding disorder/Coagulopathy is major indication in all literature.**
- Mechanical ventilation. Unable to lie prone.
- Respiratory insufficiency
- Uncontrolled HTN
- Ascites
- Combined Bx. Eg Renal and Liver or myocardium.
- Placement of Dialysis Catheter
- Hibernating Kidney (pre endovasc. Intervention)
TJRBx. Contraindications

- SVC / IVC/ Renal V thrombosis
- Absent R) IJV. (relative CI)
- Recurrent course R) Renal V
  (? Transfemoral approach)
- Iodinated Contrast anaphylaxis.
TJRBx: Technique

- Informed consent, Lab Ix. (Correct adverse features as able.)
- Pre procedure imaging (us. USS or CT). Aseptic technique.
- Supine on angiographic table,
- Conscious Sedation.
- R) IJV access, (R/T USS guidance and M/P technique). (more superior IJV access unless planning dialysis catheter placement.)
- 5fr sheath, exchange to 9fr after advancing guidewire to IVC.
- Select lower pole renal vein (Posterolateral medullary interlobar vein) with MPA catheter over glidewire then exchange for Amplatz guidewire.
- We use LABS 200 TJBx kit (COOK)
  7fr 50.5cm TJ sheath with 45deg. Preshaped tip.(dilator)
  60cm 19g quick core biopsy needle (in catheter)
TJRBx: Technique

- Advance TJ sheath to medullary vein. Gentle venogram aiming for cortical parenchymal enhancement.
- Advance Quick core needle within catheter and Biopsy (limiting excursion of Needle to < 13mm). (Direct postero-laterally to attain region of > cortical depth, reduce risk of large vessel injury or inadvertent bowel injury.
- Specimen assessed by cytologist in attendance
- Usually 2 cores.
- (? Embolise tract, Gelfoam / coils if see perforation)
TJRBx: Technique
TJR Bx: Technique

COOK Micropuncture Set

R) IJV access

Guidewire to IVC
Includes a full complement of components for liver access and tissue biopsy.

- Precurved catheter and cannula for hepatic vein access.
- Single-throw mechanical needle passes easily through duct walls into tissue.
- Multipurpose Beacon® tip catheter for increased visibility.

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TJRBlx: Technique

Catheter selecting lower pole renal v. Small contrast injections to minimise Risk of CIN

Guidewire exchange

7fr TJ sheath as close To wedged as possible
TJR RBx: Technique

R) lower pole venogram

Cortical Parenchymal Enhancement demonstrates position of capsule
TJR RBx: Technique

Limit Bx needle “Throw”

Capsule

Core Bx

Post Bx Venogram
TJR Bx: Technique

Needle tip to capsule

TJ Specimen X 20

Perc. Spec. x20
PAH Audit TJRBx
December 2004 – September 2013

- 16p, mean age 46y (22y.o -69y.o)
- M:F (11: 5)
- Indications/ Major C/I to perc. Bx
  - 12/16 Bleeding disorder/ Coagulopathy
  - 1/16 Mechanical Ventilation
  - 2/16 Unable to lie prone. 1 massive ascites, 1 severe CCF.
  - 1/16 Combined Liver / Renal Bx (and Dialysis Catheter)
PAH Audit TJRBx
December 2004 – September 2013

- Diagnostic specimen 14/16. (87.5%)
- Mean No Glomeruli. LM 9.8 (3-20), IF 3.3 (0-7)
- Mean Cores: 2.2
- Major Cx. 1/16 (6.25%)
  - Macroscopic Haematuria, (T/F), Arterial embolisation. (Arteriocalyceal fistula).
- Minor Cx. 4/16 (25%)
  - 2 perinephric haematomas (12.5%)
  - 1 Transient Macroscopic Haematuria (6.25%)
  - 1 right lumbar pain, –ve CT (pain spont. improved)
TJRBx: COMPLICATIONS

- Negative / Non Dx Bx. (overall similar to perc. Bx)
- **MAJOR:**
  - Bleeding requiring Rx. (1-2.5%)
    Mostly resusc. And Transfusion. Less frequent embolisation etc.
    Perirenal Haematoma (self limiting unless arterial aetiol.)
    <30% overall for core Bx. Even when capsular perf. Rate reported up to 90%. Perirenal fat tamponades. Partic. In obese. Cf (57-85% perc. Bx)
    Pelvicalyceal. Haematuria eg arterio-calyceal fistula
- Calyceal/ Renal pelvis puncture. Rarely symptomatic but may need ureteric stent.
- Adjacent structure injury: Not reported.
- CERVICAL Haematoma (rare even in coagulopathy
- Pneumothorax. (1/1000)
- Contrast induced nephropathy
TJR Box: COMPLICATIONS

- **MINOR:**
  - Pain, Peri-renal haematoma, Transient haematuria, Cervical Haematoma
TJRBx PAH Complications

Asymptomatic Peri-renal Haematoma

Pre Bx. Venogram

Biopsy

Check Venogram post Biopsy. Perirenal Haematoma.
TJRBx PAH Complications
Asymptomatic Peri-renal Haematoma

Perirenal Haematoma
TJR-Bx PAH Complications

Arterio-calyceal fistula

DSA, embolisation 3/7 post Bx for Macroscopic Haematuria req. Transfusion
TJR Bx PAH Complications
Arterio-calyceal fistula
DSA, embolisation 3/7 post Bx for Macroscopic Haematuria req. Transfusion

2 sites of arterial injury with pseudoaneurysm and AVF.
TJRBx : Conclusion

- Not an alternative to percutaneous RBx and not a routine Bx method but useful in armamentarium when Perc. Bx Contraindicated.
- Advantages include being able to be relatively safely performed in high risk patients with relatively low complication rate for population being performed in, but
- Not risk free, Reduced core size with reduced glomeruli/core.
- Time consuming and more expensive than Percutaneous Bx.