# Biopsia renale nel Diabete: indicazioni e risvolti terapeutici


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I° CONVEGNO NAZIONALE CONGIUNTO SIN - SID

La Malattia Renale Diabetica (DKD): Presente e Futuro dell'Approccio Integrato Nefro-Diabetologico, Rimini 60° Congresso Nazionale SIN 2-5 Ottobre, 2019

Caucasian 59year old man

T2DM (ten years), with poor glycemic control (HbA1c = 10.1%) and hypertension.

Due to RF with NS: 24UrPr 2,3 gr; Cr Cl 35 ml/min, urin sed: negative, the patient was admitted to the Nephrology Unit.

Screening for autoimmunity, complement level, IFS and IFU and hepatitis were all negative

Caucasian 54year old woman

T2DM (five years) (HbA1c = 6,4%) with hypertension; diabetic retinopathy, cerebral ischemic episodes.

Two months before appearance of RF and NS: Proteinuria 24 h: 6951 mg; Clearance creatinina: 55 ml/min; urin sed: rare rbc Admission to the Nephrology Unit.

Screening for autoimmunity, complement level, IFS and IFU and hepatitis were all negative

Caucasian 63year old man

T2DM (seven years), (HbA1c = 7,4%), ischemic cardiopathy, hypertension.

Due to NS patient was admitted to the Nephrology Unit. (24h UPr 12 gr; Creat Cl 118 ml/min, hematuria 4-6 rc/hpf).

Screening for autoimmunity, complement level, IFS and IFU and hepatitis were all negative

# Epidemiology


"25-33% of patients with T2DM have diabetic kidney disease"

"most common cause of ESRD"



Globally, the number of people with diabetes mellitus has quadrupled in the past three decades, and diabetes mellitus is the ninth major cause of death.

About 1 in 11 adults have diabetes mellitus, 90% of whom have type 2 diabetes mellitus (T2DM).

*Nature Review Endocrinol 2018*

# Diabetic Nephropathy

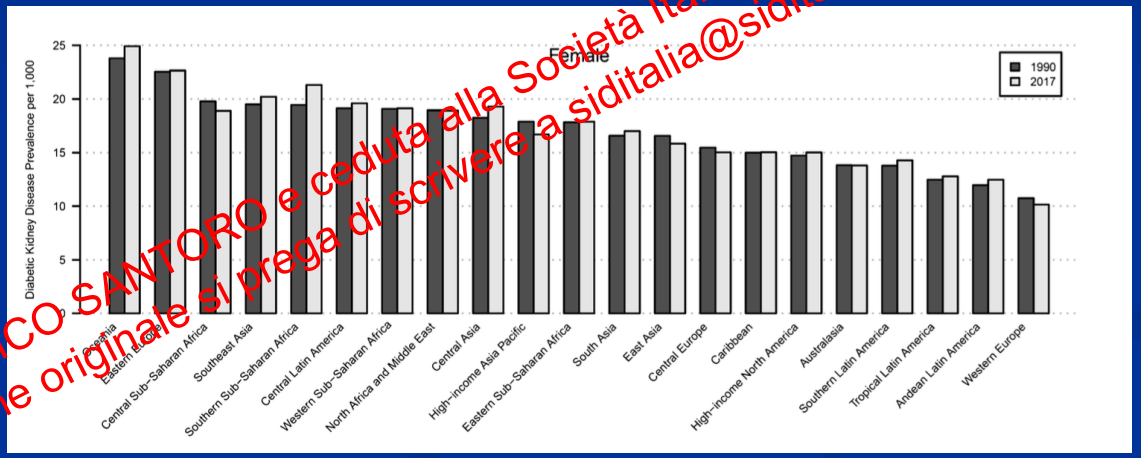
Current Diabetes Reports (2019) 19:18
https://doi.org/10.1007/s11892-019-1133-6

MICROVASCULAR COMPLICATIONS—NEPHROPATHY (M AFKARIAN AND B ROSHANRAVAN, SECTION EDITORS)

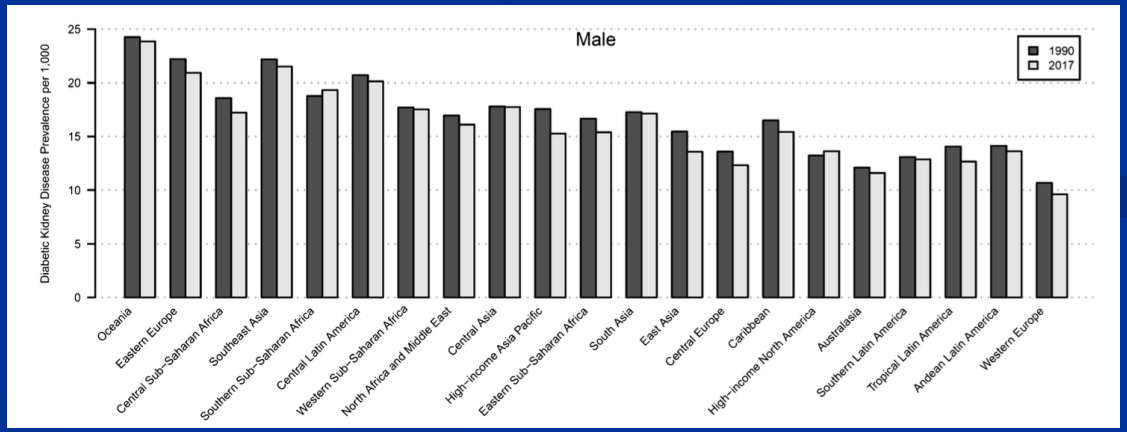
## The Global Burden of Diabetic Kidney Disease: Time Trends and Gender Gaps

Bernadette Thomas[1]

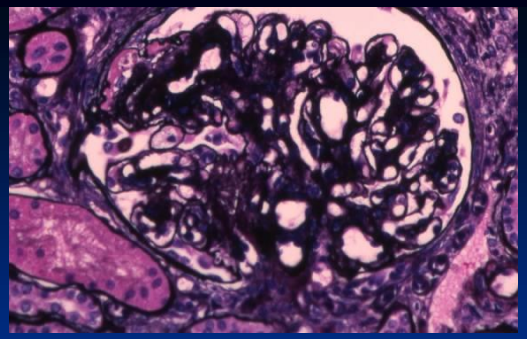
Global age-standardized prevalence of DKD in 1990 and in 2017: men: 15.48/1000; women :16.50/1000



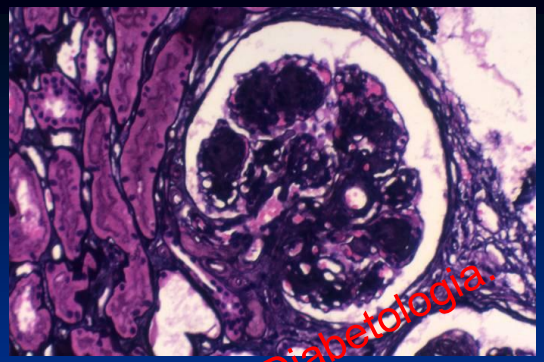

No difference between 1990 e 2017 in terms of prevalence!!



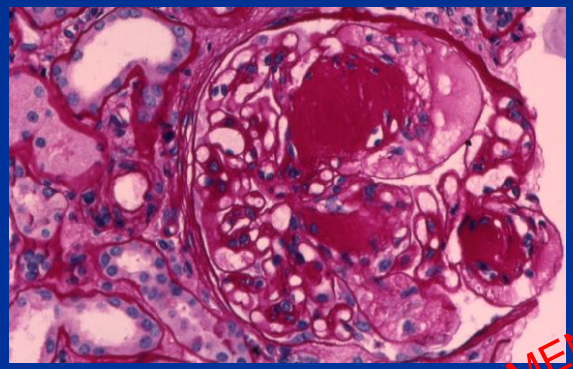
# DIABETIC NEPHROPATHY



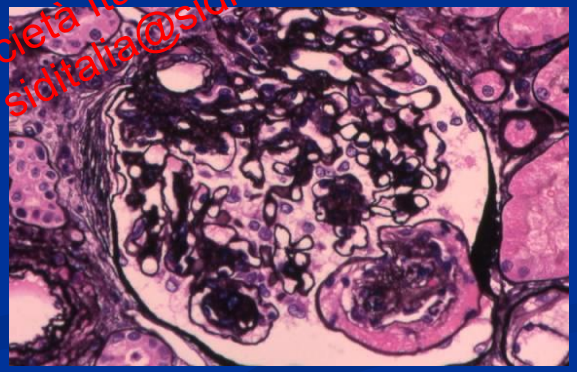
DIFFUSE
MESANGIAL INCREASE



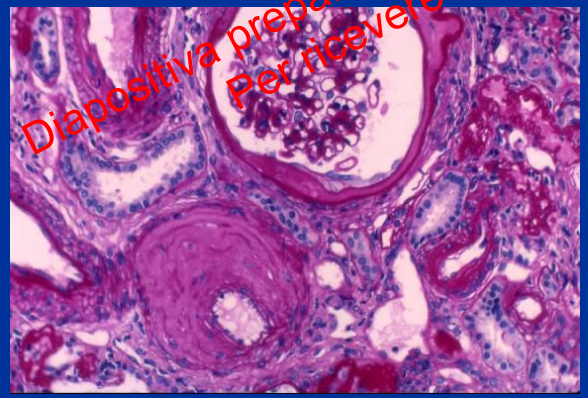
NODULAR
MESANGIAL INCREASE



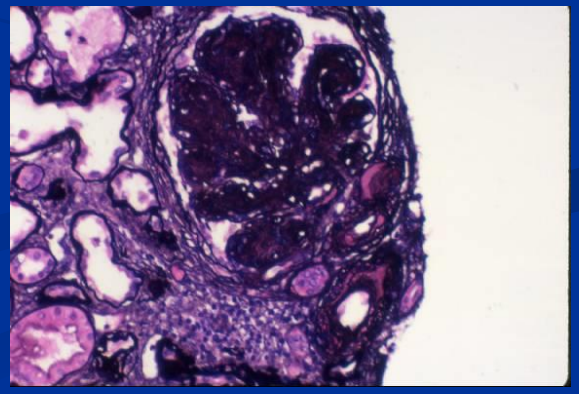
MICROANEURYSMS



MESANGIOLYSIS



AA INTIMAL FIBROSIS



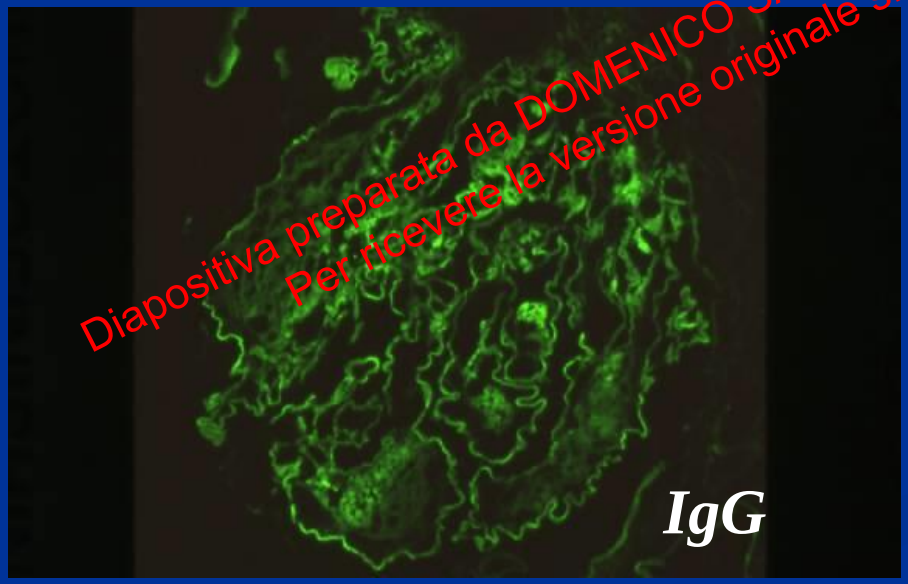
Aa IALINOSIS AT
VASCULAR POLE

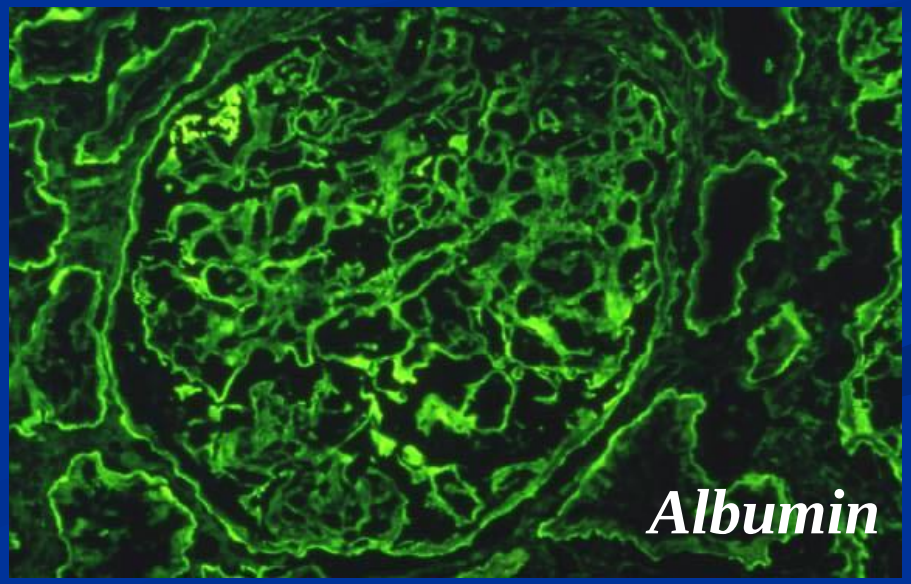
# IMMUNOFLUORESCENCE
## Findings

Linear staining of IgG and Albumin along the basement membranes of glomerulus, Bowman's capsule and tubules

Change in the extracellular matrix of basement membranes which permits "trapping" of these serum proteins



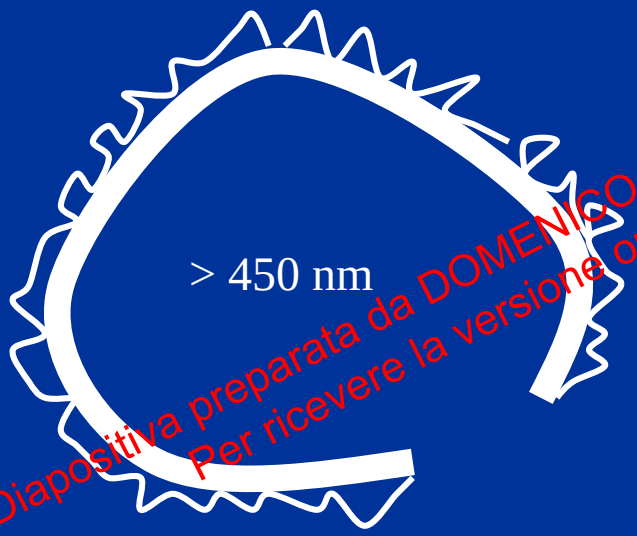


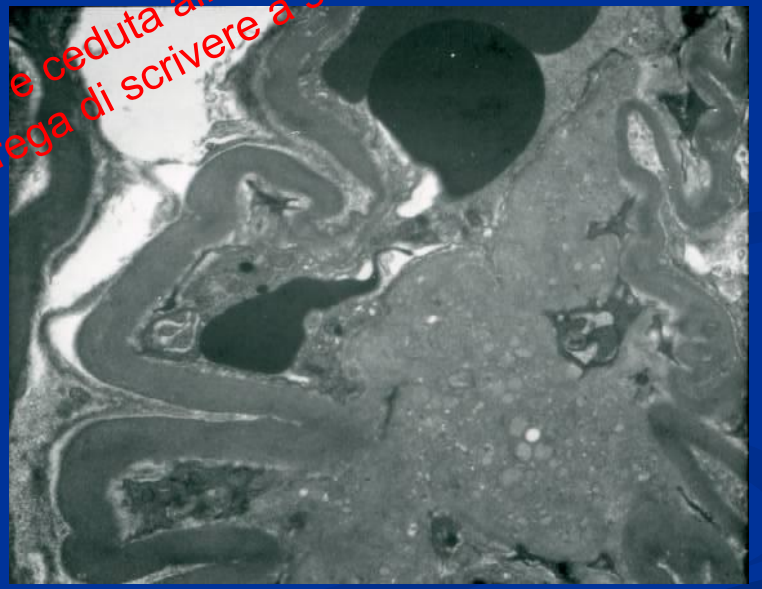



# GBM THICKENING

## n.v. = 350-400 nm

The earliest change of DKD in patients with DM ”



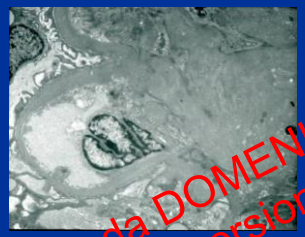



# Pathogenesis of morphological damage in T1DM

METABOLIC ALTERATIONS

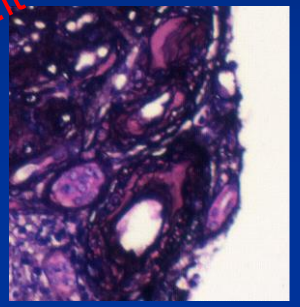
GBM
TBM
BC

THICKENING



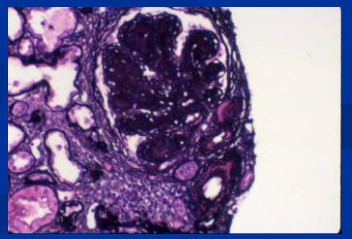
few years

Afferent and efferent arteriolar hyalinosis



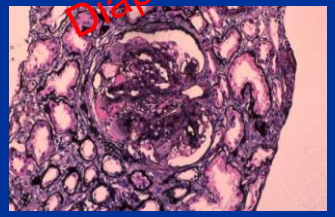
5-7 ys

mesangial widening



5-7 ys

nodular glomerulosclerosis
tubular atrophy
interstitial fibrosis



# IDDM

Glomerulopathy
(microangiopathy)

GBM, TBM, BC Thickening
Mesangial widening

<

vascular
tubular lesions
interstitial

# NIDDM

ADVANCED LESIONS → vascular / tubular / interstitial levels < subset of patients

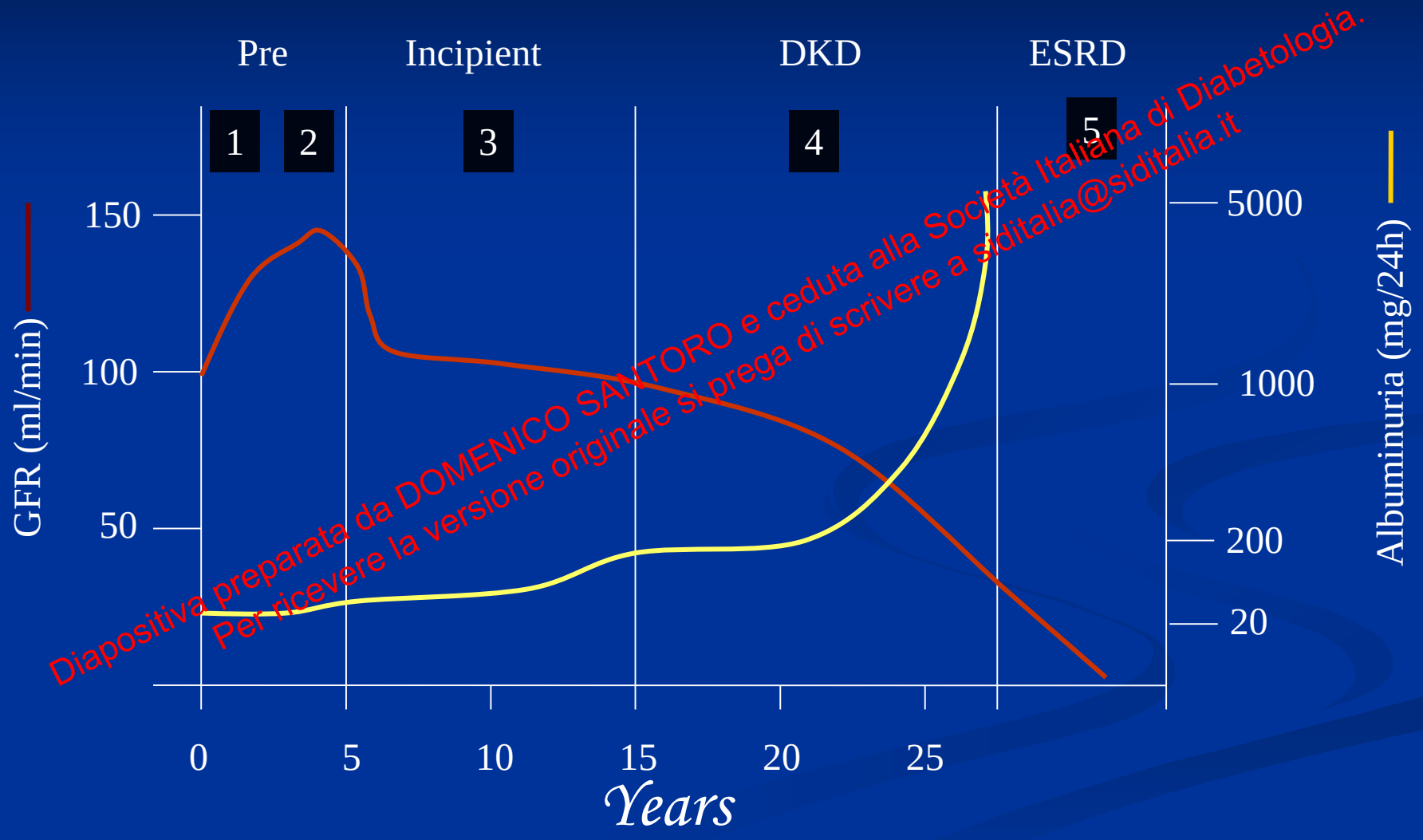
subset of patients → Glomerulopathy (microangiopathy)

vascular / tubular / interstitial levels →

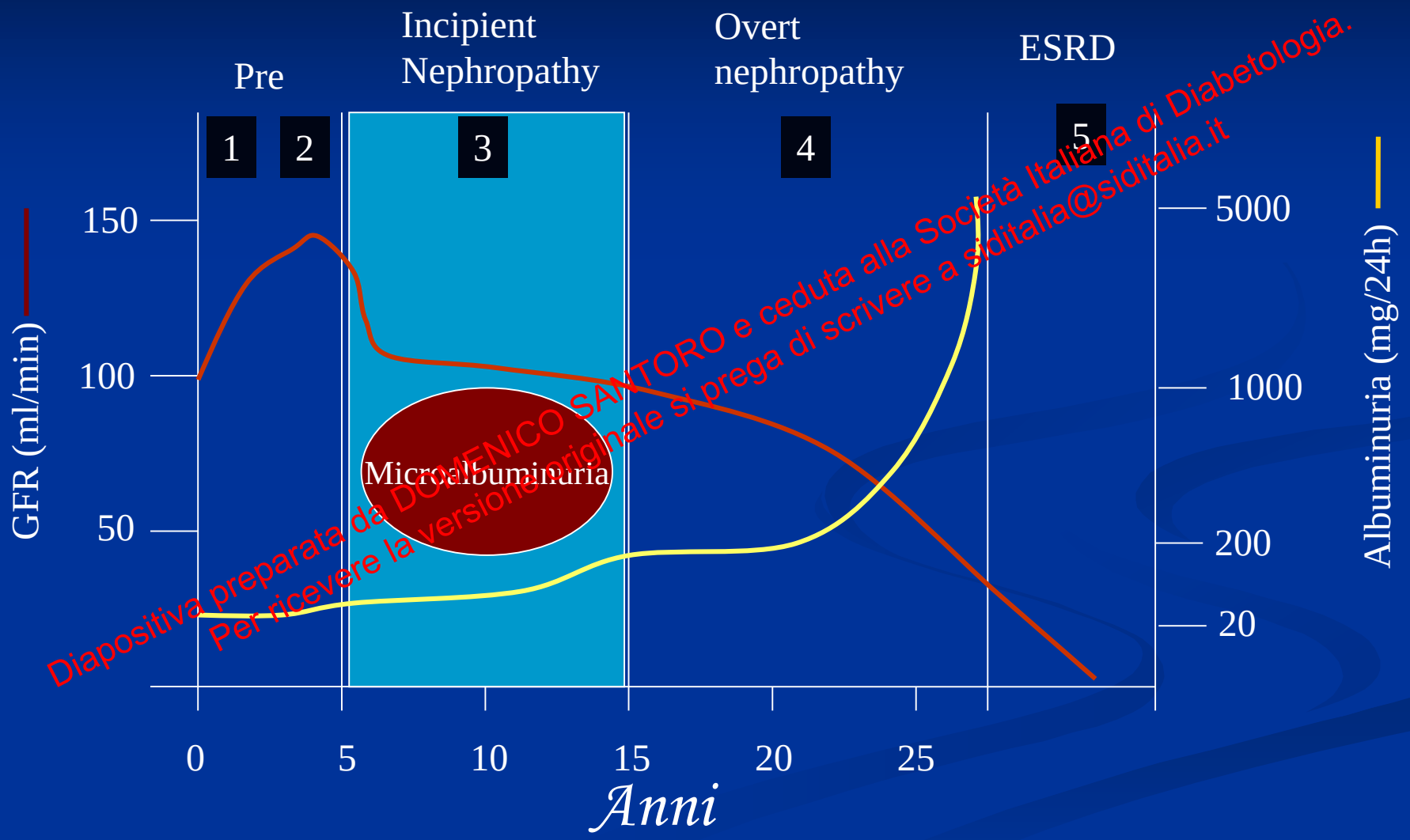
***arterio and arteriolosclerosis***

***tubular atrophy and interstitial fibrosis***

# *Natural History of DKD*



# *Is UAE always the first sign of DN ?*



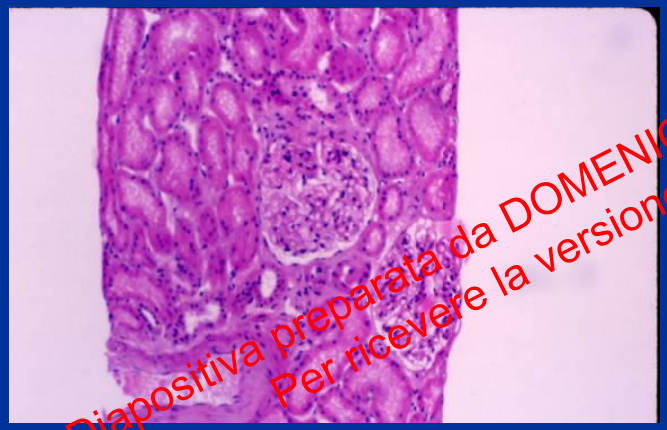
# Is UAE always the first sign of DN ?

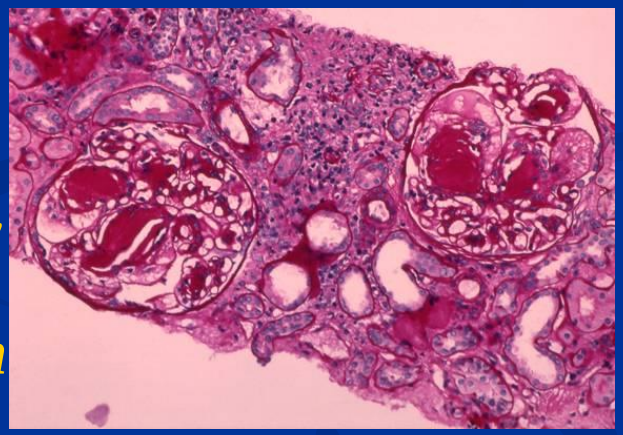
105 patients with **IDDM** (10 ys)
**NORMOALBUMINURIC**

GRF >90 ml/min
(121.2 ±16.6)

renal biopsies performed

GFR <90 ml/min
(75.9 ±11.7)





***Female***

***Retinopathy***

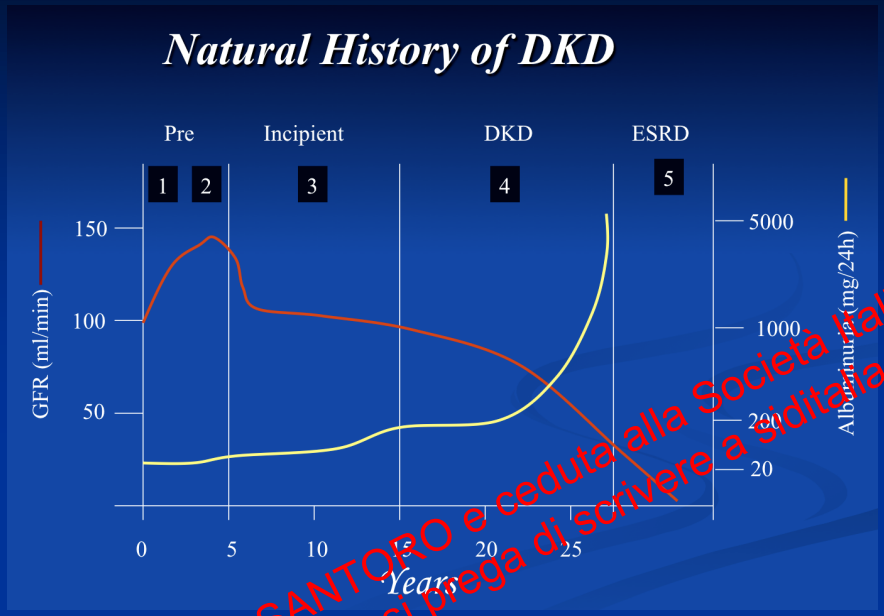
***Hypertension***



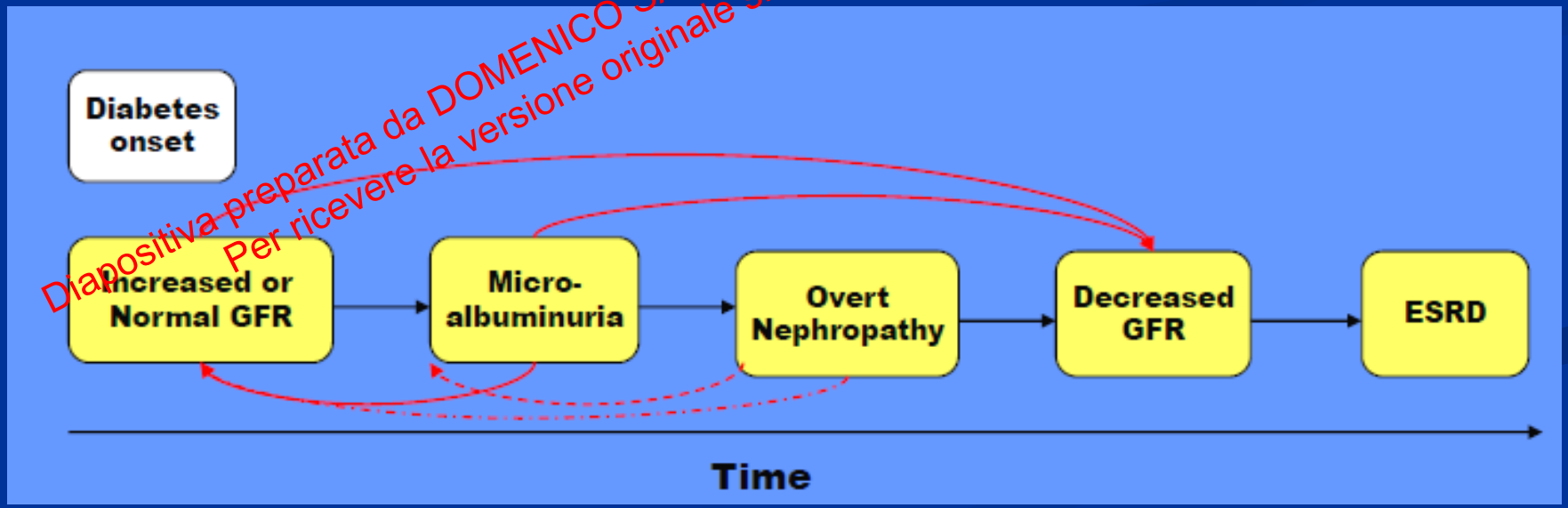
***Regular measurements of GFR be performed in long-standing normoalbuminuric type 1 diabetic female diabetic patients, especially in those with retinopathy or hypertension***

Caramori ML et al Diabetes 2003

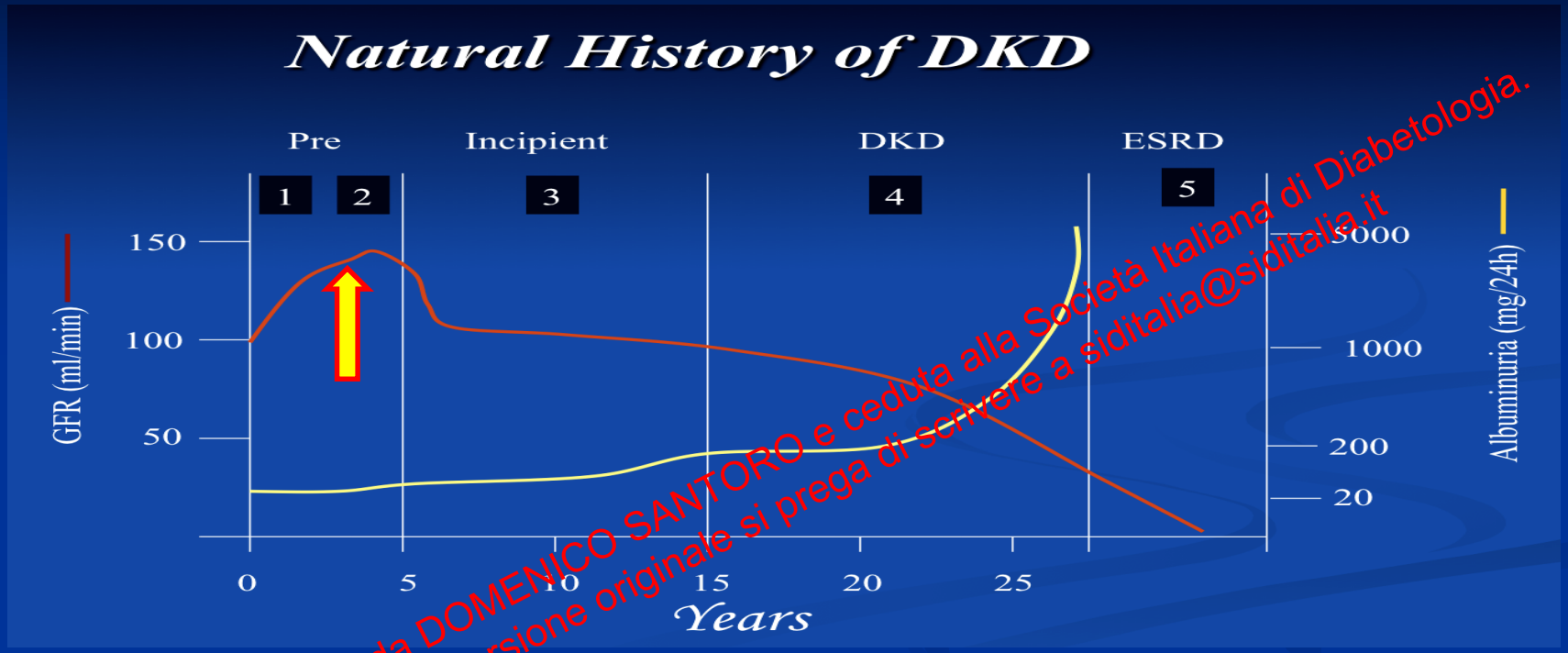
# Natural History of Diabetic Nephropathy





# The role of hyperfiltration in DKD

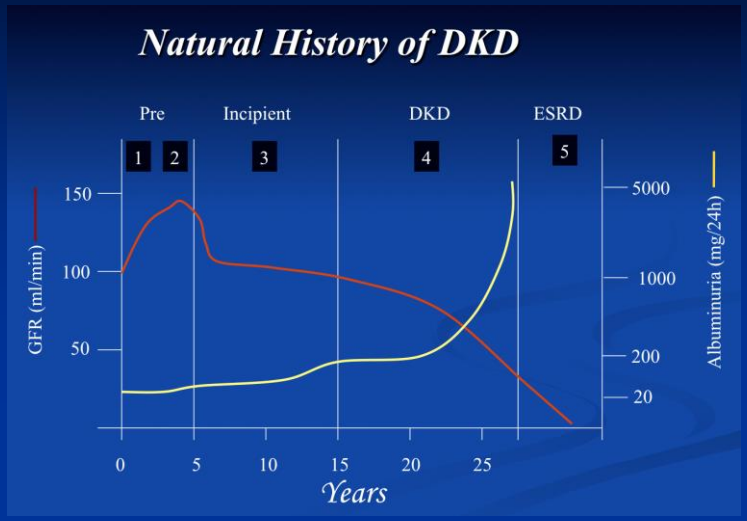


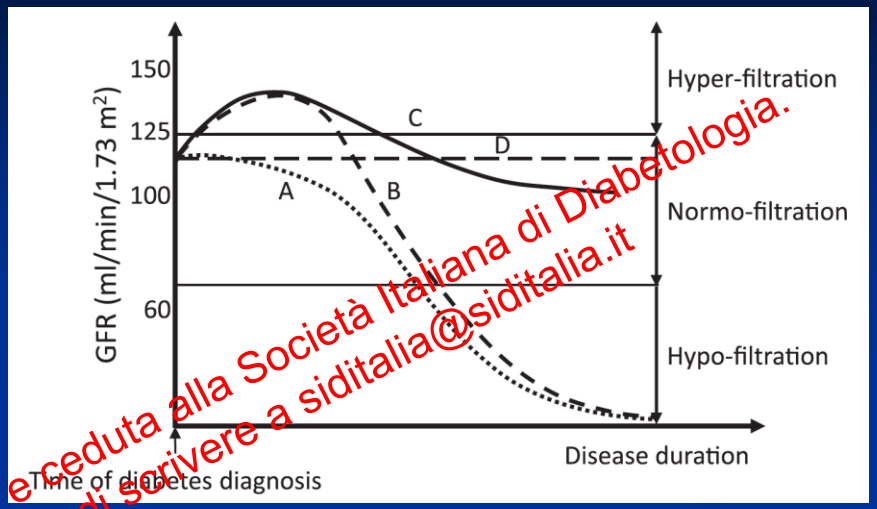



Individuals with glomerular hyperfiltration were **at increased risk** of progression to diabetic nephropathy.

Magee GM et al Diabetologia 2009

# Hyperfiltration in Diabetic Nephropathy






The prevalence of hyperfiltration
type 1 diabetes varies from less than 25% to more than 75%
type 2 diabetes are significantly lower, ranging between 0% and more than 40%.

Biological factors that may influence GFR in the hyperfiltration range include glucose control, diabetes duration, BMI, sex, pubertal status in type 1 diabetes and age in type 2 diabetes.

Jerums G et al Diabetologia 2010

# Clinical presentation

## Diabetic patients with Proteinuria and/or Hematuria and/or low eGFR



**The prevalence of non diabetic renal disease varies from 12% to 79%, depending on the selection criteria and the population being studied.**

# Clinical presentation

Diabetic patients with Proteinuria and/or Hematuria and/or low eGFR



*Renal Biopsy*

*No Renal Biopsy*

# Identifying Parameters to Distinguish Non-Diabetic Renal Diseases from Diabetic Nephropathy in Patients with Type 2 Diabetes Mellitus: A Meta-Analysis

Shuang Liang[☯], Xue-Guang Zhang[☯], Guang-Yan Cai*, Han-Yu Zhu, Jian-Hui Zhou, Jie Wu, Pu Chen, Shu-peng Lin, Qiang Qiu, Xiang-Mei Chen*

Department of Nephrology, State Key Laboratory of Kidney Diseases, Chinese PLA General Hospital, Beijing, China

- PubMed, Embase, CKNI: 1990-2012
- 26 studies (2.322 patients)

| | DN | NDRD |
|---|---|---|
| Duration of DM | Longer | Shorter |
| Presence of Retinopathy | Yes (except 17,6%) | No (except 23,6%) |
| Blood pressure | Higher | Lower |
| HbA1c | Higher | Lower |



No difference in:

- ages
- 24h Urinary protein
- Serum creatinine
- Clearance creatinine
- BUN

PLoS One. 2013 May 14;8(5):e64184.

# Retinopathy in DKD


T1DM




T2DM

# Hematuria in DKD

| Authors | Year of publication | n | Patients with haematuria (%) | Definition of haematuria |
|---|---|---|---|---|
| O'Neill WM[1] | 1983 | 30 | 9 (30.0%) | >10/hpf |
| Parving HH[3] | 1992 | 27 | 4 (14.8%) | ≧3/hpf |
| Matsumae T[4] | 1994 | 162 | 40 (24.5%) | n.d. |
| Matsumura N[5] | 1994 | 143 | 15 (10.5%) | ≧5/hpf |
| Tone A[6] | 2005 | 25 | 11 (44.0%) | >10/μL |
| Soni S[7] | 2006 | 44 | 4 (9.1%) | >3/hpf |
| Pham TT[8] | 2007 | 64 | 48 (75.0%) | ≧2/hpf |
| Akimoto T[9] | 2008 | 34 | 14 (41.2%) | >10/hpf |
| Zhou J[10] | 2008 | 60 | 10 (16.7%) | n.d. |
| Lin YL[11] | 2009 | 24 | 8 (33.3%) | >5/hpf |
| Mou S[12] | 2010 | 33 | 10 (30.3%) | ≧2/hpf |
| Chang TI[13] | 2011 | 43 | 24 (55.8%) | >3/hpf |
| Chong YB[14] | 2012 | 69 | 28 (40.6%) | n.d. |
| Oh SW[15] | 2012 | 50 | 39 (78.0%) | ≧5/hpf |

Prevalence of microscopic haematuria in patients with biopsy-confirmed diabetic nephropathy

**9.1-78%**

**>3->10hpf**



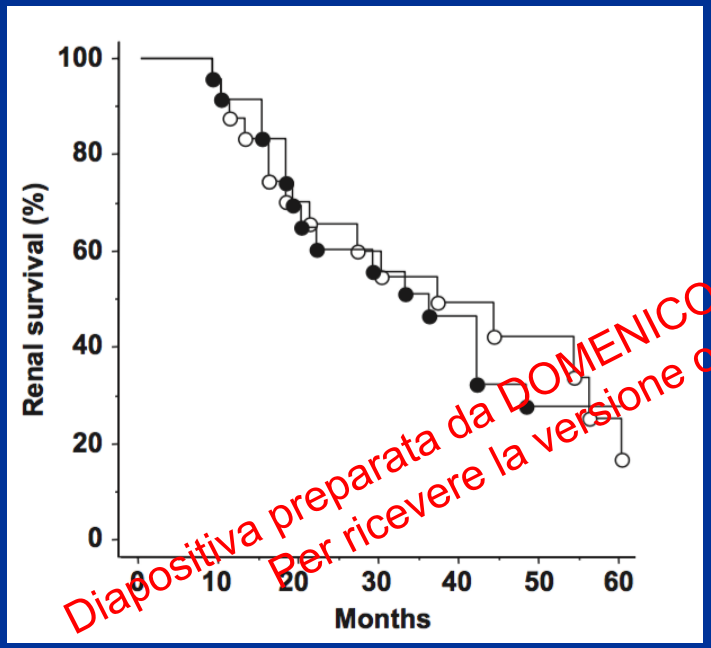
Okada T, Nephrology (Carlton). 2013 Aug;18(8):563-8.

# Hematuria in DKD

**Eighty-four type 2 diabetes patients with overt proteinuria and biopsy-confirmed DN:**

**Patients with persistent haematuria (group 1) and with non-persistent haematuria (group 2)**

Clinical findings of two groups




Renal survival rates in relation to persistent microscopic haematuria after renal biopsy

Histological findings of pts with persistent microscopic haematuria

| | Multivariate analysis OR (95% CI) | *P*-value |
|---|---|---|
| Diffuse lesion | 1.55 (0.24–10.02) | 0.64 |
| Nodular lesion | 0.23 (0.04–1.25) | 0.09 |
| Exudative lesion (yes/no) | 0.38 (0.09–1.61) | 0.19 |
| Arteriolar hyalinosis | 2.81 (1.03–7.70) | 0.04 |
| Interstitial fibrosis | 0.57 (0.10–3.19) | 0.52 |
| Percentage of global glomerulo-sclerosis (%) | 0.98 (0.94–1.02) | 0.26 |

**No difference.**

Okada T, Nephrology (Carlton). 2013 Aug;18(8):563-8.

# Hematuria in DKD



JDI Journal of Diabetes Investigation Open access
Official Journal of the Asian Association for the Study of Diabetes
ORIGINAL ARTICLE

## Dysmorphic erythrocytes are superior to hematuria for indicating non-diabetic renal disease in type 2 diabetics

Zhe-yi Dong, Yuan-da Wang, Qiang Qiu, Kai Hou, Li Zhang, Jie Wu, Han-yu Zhu, Guang-yan Cai, Xue-feng Sun, Xue-guang Zhang, Mo-yan Liu, Jia Kou, Xiang-mei Chen*

Department of Nephrology, Chinese PLA General Hospital, Chinese PLA Institute of Nephrology, State Key Laboratory of Kidney Diseases, National Clinical Research Center of Kidney Diseases, Beijing, China

# The Role of Dysmorphic Erythrocytes

198 patients with type 2 diabetes who underwent kidney biopsies between 2012 and 2013.

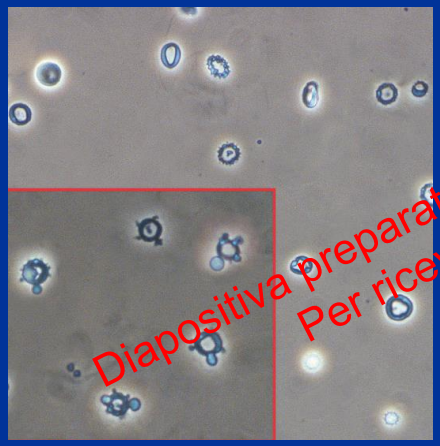


**Table 2** | Comparison of the incidence of hematuria in the diabetic nephropathy and non-diabetic renal disease groups

| Definition of hematuria (RBCs/hpf) | DN group, presence (%) | NDRD group, presence (%) | *P*-value |
|---|---|---|---|
| >2 | 24 (39.3%) | 64 (46.7%) | 0.29 |
| >3 | 19 (31.1%) | 60 (43.8%) | 0.77 |
| >5 | 15 (24.6%) | 42 (30.7%) | 0.33 |
| >7 | 10 (16.4%) | 31 (22.6%) | 0.27 |
| >8 | 7 (11.5%) | 27 (19.7%) | 0.13 |
| >10 | 4 (6.6%) | 23 (16.8%) | 0.04 |
| >15 | 3 (4.9%) | 15 (10.9%) | 0.17 |
| Glomerular hematuria | 2 (3.3%) | 34 (24.8%) | <0.001 |



J Diabetes Investig 2016; 7: 115–120

# The Role of Dysmorphic Erythrocytes

Three different definitions of hematuria in urine sediment. were used:

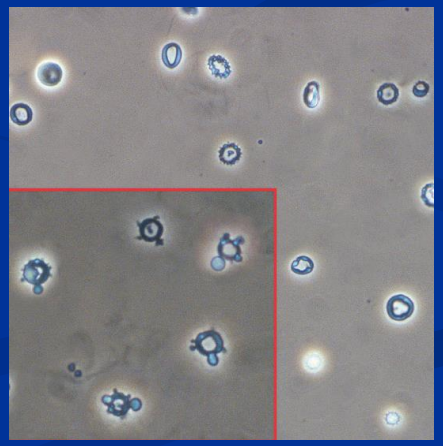
- >3 RBCs/ hpf,
- >10 RBCs/hpf
- dysmorphic erythrocytes >80%

**Table 3** | Predictive value of three different diagnostic criteria for hematuria

| | >3 RBCs/hpf | >10 RBCs/hpf | Glomerular hematuria |
|---|---|---|---|
| Sensitivity | 0.44 | 0.17 | 0.25 |
| Specificity | 0.61 | 0.93 | 0.97 |
| Positive predictive value | 0.76 | 0.85 | 0.94 |
| Negative predictive value | 0.35 | 0.33 | 0.36 |
| ROC AUC | 0.57 | 0.56 | 0.61 |



If a patient had glomerular hematuria, the probability of NDRD was 94%.
Conversely, the rate of exclusion of NDRD was 36%



J Diabetes Investig 2016; 7: 115–120

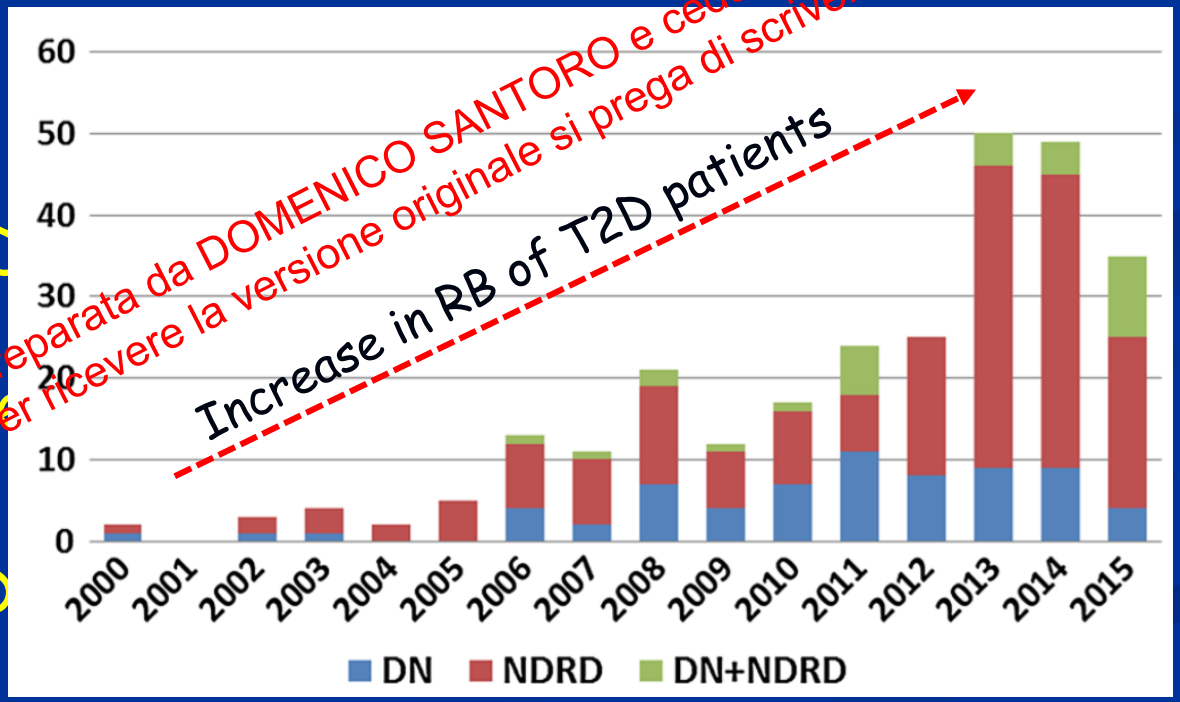
# Indication for renal biopsy and Type of non-diabetic renal disease

# Type of NDRD

Single-center retrospective analysis based on medical records:
273 T2D patients (172 men, mean age: 51.1 ± 12.4 years) who underwent renal biopsy between February 2000 and October 2015.

Patients

- pure D
- isolat
- NDRD






Int Urol Nephrol (2016) 48:1691–1698

# Type of NDRD

| Pathologic diagnosis based on renal biopsy | NDRD ($N = 175$) | DN + NDRD ($N = 30$) | Total ($N = 205$) |
|---|---|---|---|
| Membranous nephropathy | 52 (29.7) | | 58 (28.3) |
| IgA nephropathy | 40 (22.9) | | 41 (20) |
| Mesangioproliferative glomerulonephritis (MPGN) | 14 (8.0) | | 14 (6.8) |
| Minimal change disease | 6 (3.4) | | 6 (2.9) |
| Crescentic glomerulonephritis | 4 (2.3) | | 4 (2.0) |
| Focal segmental glomerulosclerosis | 3 (1.7) | | 3 (1.5) |
| Interstitial nephritis | 10 (5.7) | | 11 (5.4) |
| Lupus nephritis | 9 (5.1) | | 9 (4.4) |
| HBV-associated glomerulonephritis | 8 (4.6) | | 8 (3.9) |
| Hypertensive renal arteriolar sclerosis | 6 (3.4) | | 25 (12.2) |
| ANCA-associated vasculitis | 5 (2.9) | | 6 (2.9) |
| Thrombotic microangiopathy (TMA) | 4 (2.3) | | 6 (2.9) |
| Amyloidosis | 4 (2.3) | | 4 (2.0) |
| Henoch-Schonlein purpura | 1 (0.6) | | 1 (0.5) |
| Lipoprotein glomerulopathy | 1 (0.6) | | 1 (0.5) |
| Acute tubular necrosis | 1 (0.6) | | 1 (0.5) |
| Others | 7 (3.9) | | 7 (3.3) |



Int Urol Nephrol (2016) 48:1691–1698

# Clinical signs of NDRD

Patients with NDRD

- Shorter duration of diabetes
- Lower diabetic retinopathy (DR, 6.9 %)
- Lower renal failure (28.0 %) and higher estimated glomerular filtration rates (eGFR)
- Lower systolic blood pressure (SBP)

No significant between-group differences were observed with respect to proteinuria and hematuria.



Int Urol Nephrol (2016) 48:1691–1698

ckj OXFORD

Clinical Kidney Journal, 2018, vol. 11, no. 3, 342–347

doi: 10.1093/ckj/sfx111
Advance Access Publication Date: 18 September 2017
Original Article

ORIGINAL ARTICLE

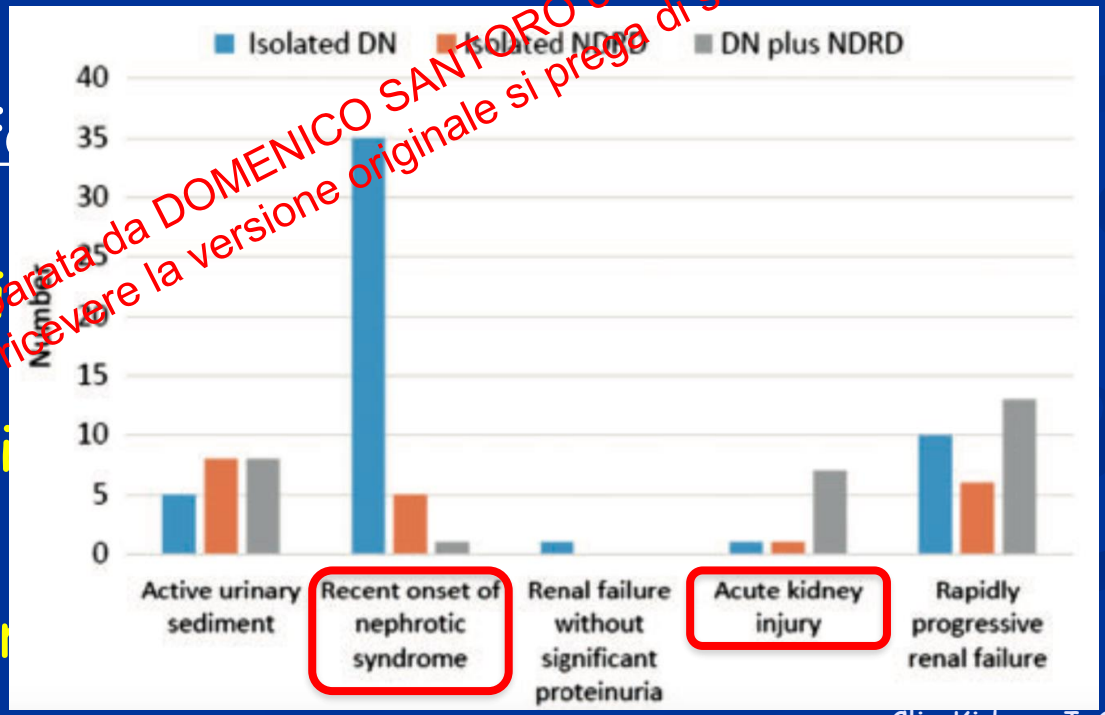
# Clinical and pathological characteristics of non-diabetic renal disease in type 2 diabetes patients

Kittrawee Kritmetapak[1], Sirirat Anutrakulchai[1], Chatlert Pongchaiyakul[2] and Anucha Puapairoj[3]

Retrospective analysis of medical records of 101 T2DM pts who underwent renal biopsy under suspicion of NDRD from January 2011 through November 2015.

## Indication f

- Nephroti
- Progressi
- Active U






Clin Kidney J. 2018 Jun;11(3):342-347.

ckj OXFORD

Clinical Kidney Journal, 2018, vol. 11, no. 3, 342–347

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Original Article

ORIGINAL ARTICLE

# Clinical and pathological characteristics of non-diabetic renal disease in type 2 diabetes patients

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| Histology | NDRD superimposed on DN (N = 29)[a] | Isolated NDRD (N = 20) | P-value |
|---|---|---|---|
| Acute tubular necrosis | 14 (38.9) | 0 (0) | <0.001 |
| Acute interstitial nephritis | 12 (33.3) | 1 (5.0) | 0.007 |
| IgA nephropathy | 1 (2.8) | 7 (35.0) | 0.005 |
| Membranous nephropathy | 0 (0) | 5 (25.0) | 0.008 |
| Lupus nephritis | 2 (5.6) | 4 (20.0) | 0.21 |
| Crescentic glomerulonephritis | 3 (8.2) | 1 (5.0) | 0.64 |
| Membranoproliferative glomerulonephritis | 0 (0) | 1 (5.0) | 0.22 |
| Focal segmental glomerulosclerosis | 1 (2.8) | 0 (0) | 0.41 |
| IgM nephropathy | 2 (5.6) | 1 (5.0) | 1.00 |
| Chronic interstitial nephritis | 1 (2.8) | 0 (0) | 1.00 |

Multivariate analysis of clinical parameters in patients with NDRD with or without DN

| Variables | OR | 95% CI | P-value |
|---|---|---|---|
| Male gender | 4.43 | 1.39–14.15 | 0.01 |
| Duration of diabetes (>8 years) | 0.15 | 0.04–0.49 | 0.002 |
| Glycated hemoglobin (HbA1c) | 0.16 | 0.05–0.47 | 0.001 |
| Active urinary sediment[a] | 4.75 | 1.46–15.43 | 0.01 |

[a]Active urinary sediment is defined as 10 or more red and white blood cells per high-power field.



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# The Modern Spectrum of Renal Biopsy Findings in Patients with Diabetes

*Shree G. Sharma,* Andrew S. Bomback,† Jai Radhakrishnan,† Leal C. Herlitz,‡ Michael B. Stokes,‡ Glen S. Markowitz,‡ and Vivette D. D'Agati‡*

Consecutive native renal biopsies accessioned in the Columbia Renal Pathology Laboratory from January through December 2011 were reviewed retrospectively for clinical evidence of DM.
Of 2642 native biopsies, 620 diabetic patients (23.5%) were identified

| Characteristics | DN Alone | DN Plus NDRD | NDRD Alone |
|---|---|---|---|
| Participants (*n*) | **(37%)** 227 | **(26%)** 164 | **(36%)** 220 |
| Age (yr) | 59 (49–65) | 63 (55–72)[a] | 63 (54–70)[b] |
| Male sex | 129 (56.8) | 100 (61.0) | 142 (64.6) |
| Race | | | |
| Unknown | 108 (47.6) | 57 (34.8)[a] | 104 (47.3)[c] |
| White | 62 (27.3) | 63 (38.4)[a] | 70 (31.8) |
| African American | 39 (17.2) | 33 (20.1) | 29 (13.2) |
| Hispanic | 12 (5.3) | 7 (4.3) | 8 (3.6) |
| Asian | 4 (1.8) | 4 (2.4) | 7 (3.2) |
| Other | 2 (0.9) | 0 (0.0) | 2 (0.9) |
| DM type 1 | 9 (4.0) | 5 (3.1) | 2 (0.9)[b] |
| Duration of DM (yr) | 13 (8–17) | 10 (7–18) | 5 (3–10)[b,c] |
| Serum creatinine (mg/dl) | 2.3 (1.6–3.8) | 3.1 (1.7–5.2)[a] | 2.3 (1.5–4.4)[c] |
| eGFR (ml/min per 1.73 $m^2$) | 31.3 (17.5–55.2) | 21.4 (12.5–46.6)[a] | 32.5 (14.3–60.0)[c] |
| Proteinuria (g/d) | 5.0 (2.8–8.8) | 5.0 (2.0–8.0) | 2.9 (1.4–7.1)[b,c] |



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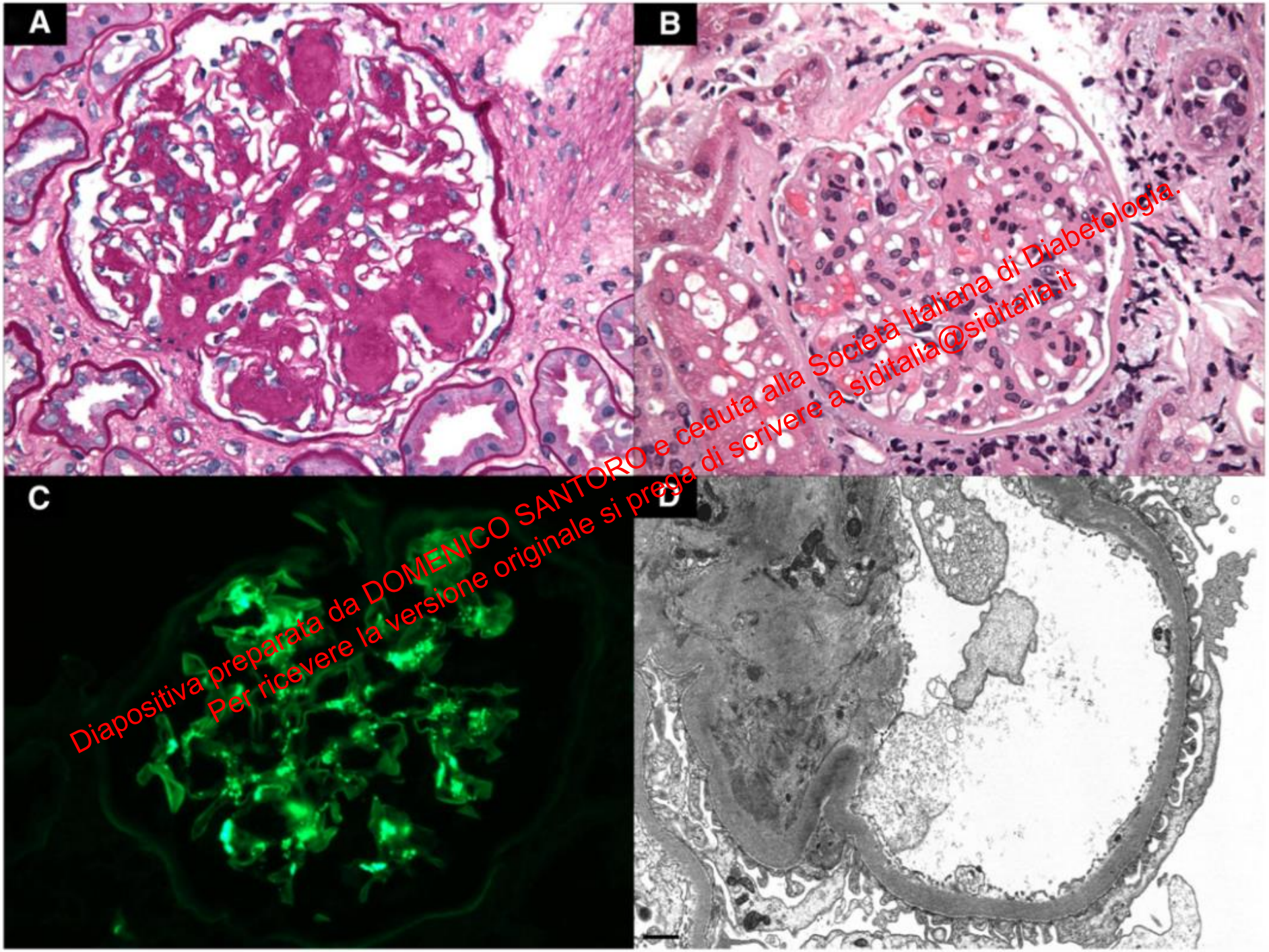

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63%

36%

27%

| Types of NDRD (n) | NDRD Alone ($n$=220) | DN Plus NDRD ($n$=164) | $P$ Value[a] |
|---|---|---|---|
| Acute tubular necrosis (109) | 38 (17.3) | 71 (43.3) | <0.001 |
| FSGS (69) | 48 (21.8) | 21 (12.8) | 0.02 |
| Primary FSGS (6) | 6 (2.7) | 0 (0.0) | 0.03 |
| Secondary FSGS (63)[b] | | | |
| HTN related | 19 (8.6) | 10 (6.1) | 0.35 |
| HTN plus obesity related | 16 (7.3) | 10 (6.1) | 0.65 |
| Obesity related | 4 (1.8) | 1 (0.6) | 0.30 |
| Other[c] | 3 (1.4) | 0 (0.0) | 0.13 |
| Hypertensive nephrosclerosis (70)[b] | 39 (17.7) | 31 (18.9) | 0.77 |
| IgA nephropathy (35) | 23 (10.5) | 12 (7.3) | 0.29 |
| Membranous GN (23) | 18 (8.2) | 5 (3.0) | 0.04 |
| Pauci-immune crescentic GN (19) | 15 (6.8) | 4 (2.4) | 0.05 |
| Acute interstitial nephritis (18) | 11 (5.0) | 7 (4.3) | 0.73 |
| Amyloidosis (10) | 10 (4.5) | 0 (0) | 0.01 |
| Myeloma cast nephropathy (10) | 8 (3.6) | 2 (1.2) | 0.14 |
| Acute postinfectious GN (6) | 3 (1.4) | 3 (1.8) | 0.72 |
| Atheroembolic disease (5) | 2 (0.9) | 3 (1.8) | 0.43 |
| Others (10) | 5 (2.3) | 5 (3.0) | 0.64 |



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# The Modern Spectrum of Renal Biopsy Findings in Patients with Diabetes

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| Variables | OR (95% CI) | *P* Value |
|---|---|---|
| Proteinuria (mg/d) | | |
| <500 | 1.00 (reference) | |
| 500–3500 | 1.28 (0.39 to 4.20) | 0.68 |
| >3500 | 0.55 (0.19 to 1.66) | 0.29 |
| eGFR (ml/min per 1.73 $m^2$) | | |
| >60 | 1.00 (reference) | |
| 30–60 | 0.89 (0.35 to 2.25) | 0.81 |
| 15–30 | 1.42 (0.53 to 3.82) | 0.49 |
| ≤15 | 1.54 (0.48 to 4.96) | 0.47 |
| Age | 1.03 (1.00 to 1.06) | 0.06 |
| Male sex | 1.05 (0.84 to 2.02) | 0.89 |
| Race | | |
| Unknown | 1.00 (reference) | |
| White | 0.93 (0.46 to 1.91) | 0.85 |
| Black | 1.38 (0.49 to 3.84) | 0.54 |
| Hispanic | 1.07 (0.27 to 4.23) | 0.93 |
| Asian | 1.66 (0.26 to 10.67) | 0.59 |
| Duration of diabetes | 0.95 (0.91 to 0.98) | 0.004 |
| AKI | 1.44 (0.67 to 3.07) | 0.35 |
| Low complements | 4.70 (0.49 to 45.42) | 0.18 |
| M-spike (serum or urine) | 1.50 (0.51 to 4.37) | 0.46 |

DN

NDRD



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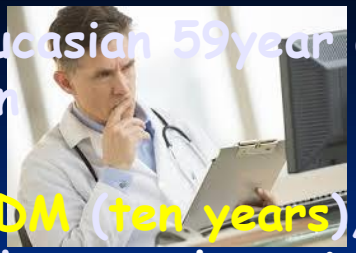
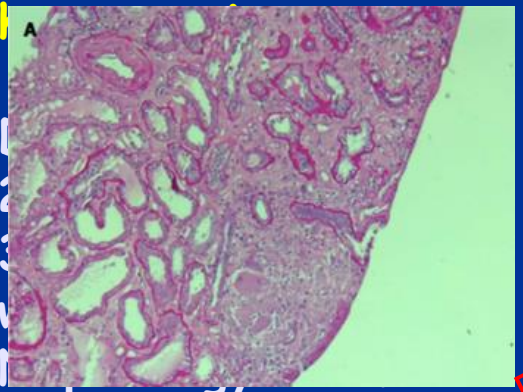
Caucasian 59year old man

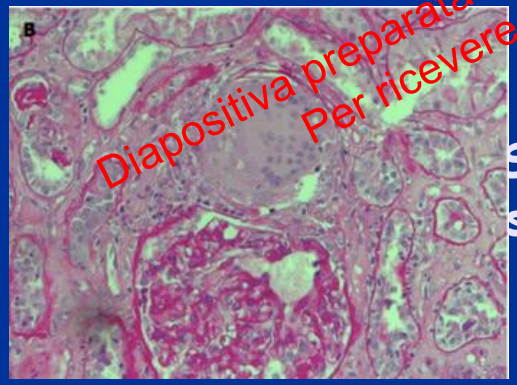


T2DM (ten years), with poor glycemic control (HbA1c = 10.1%) and

RENAL BIOPSY?

Renal Sarcoidosis



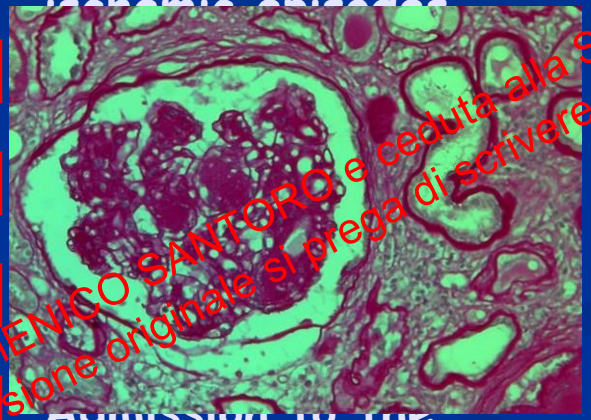


Caucasian 59year old woman

T2DM (ten years), (HbA1c = 6.4%) with hypertension; diabetic retinopathy, cerebral

RENAL BIOPSY?

Diabetic Nephropathy



Admission to the Nephrology Unit.

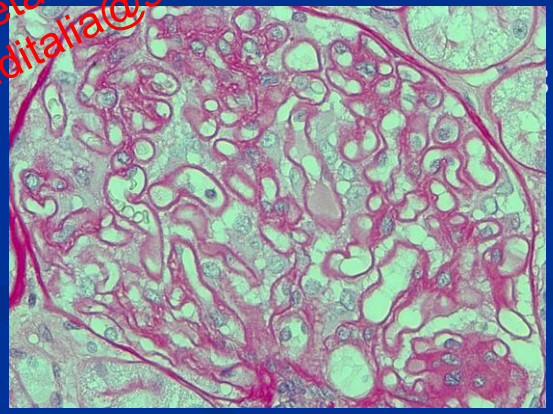
Screening for autoimmunity, complement level IFS and IFU and hepatitis were all negative

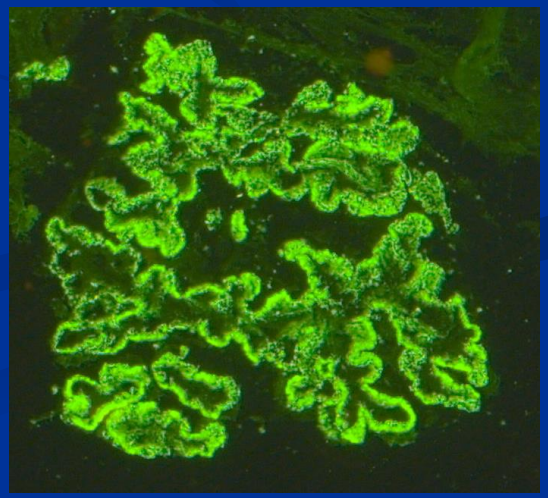
Caucasian 59year old man

T2DM (ten years), (HbA1c = 7.4%), ischemic cardiopathy, hypertension.

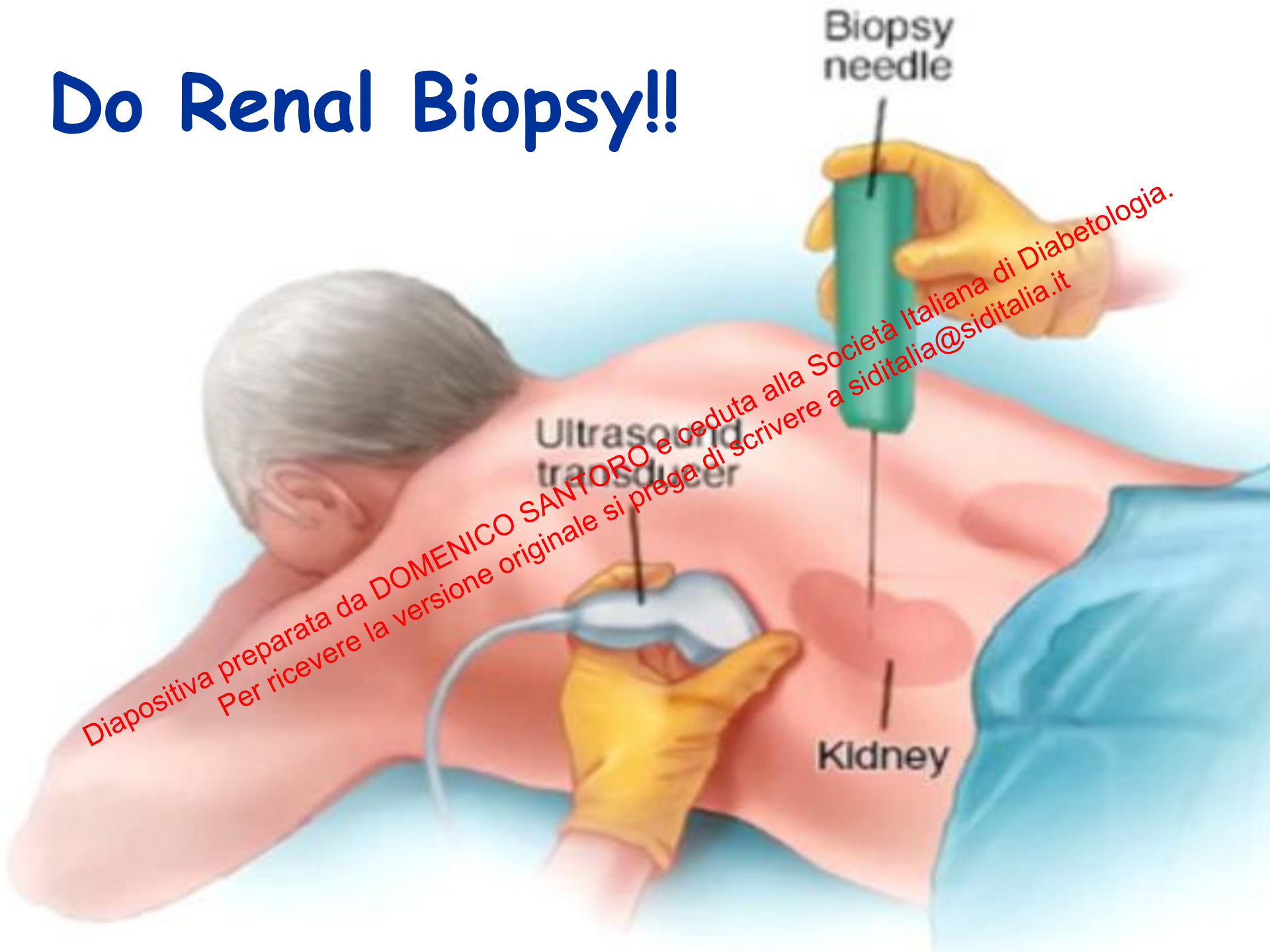
RENAL BIOPSY?

Membranous Nephropathy





# Do Renal Biopsy!!



# Home take messages

About 1/3-1/4 of diabetic patients will present Diabetic Nephropathy
DN is the leading cause of ESRD in western countries.

Recent data show that renal biopsy in diabetic patients is increasing (25% cases of Columbia) and in 2/3 of cases a renal damage non-DM correlated can be found.

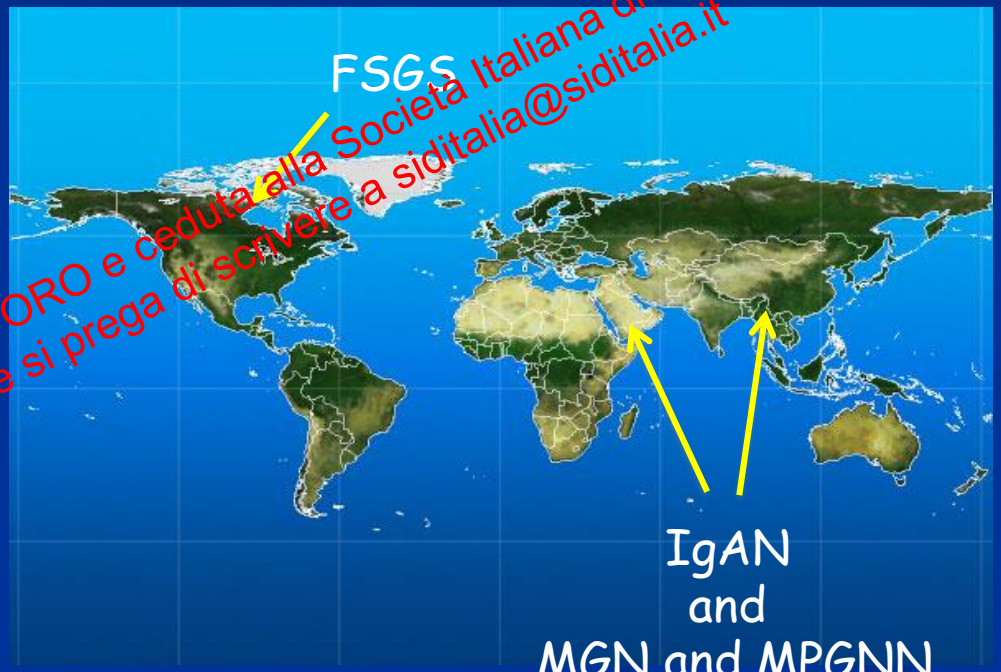
Clinical, labs and instrumental parameters may help nephrologist to guide in decision of RB:

- Duration of DM
- Diabetic Retinopathy
- Glomerular Hematuria
- Other renal or systemic alterations

# Home take messages

There are different type of NDRD (MN, IgAN, FSGS etc) that may occour in DM and most of them can receive a specific treatment.

Incidence and prevalence may vary in relation of indication of RB and geographic areas.




Diapositiva preparata da DOMENICO SANTORO e ceduta alla Società Italiana di Diabetologia.
Per ricevere la versione originale si prega di scrivere a siditalia@siditalia.it
Grazie per l'attenzione!