Les complications rénales et de l'appareil urinaire

Cystite hémorragique

Principales causes

- cystite bactérienne banale
- chimiothérapie : cyclophosphamide, ifosfamide (via un catabolite, l'acroléine), survenant précocement après l'administration du cytostatique (1 à 3 jours)
- greffe de moelle osseuse : polyomavirus BK, adénovirus, survenant tardivement après la greffe (25 jours en moyenne, entre une et 18 semaines en intervalle)
- radiothérapie
- se méfier des troubles de coagulation facilitateurs (thrombopénie) et d'un cancer vésical méconnu sous-jacent

Fig. 1 Schematic representation of inactivation of ifosfamide toxic metabolites by mesna in the urinary bladder. (Reproduced with permission) [7]

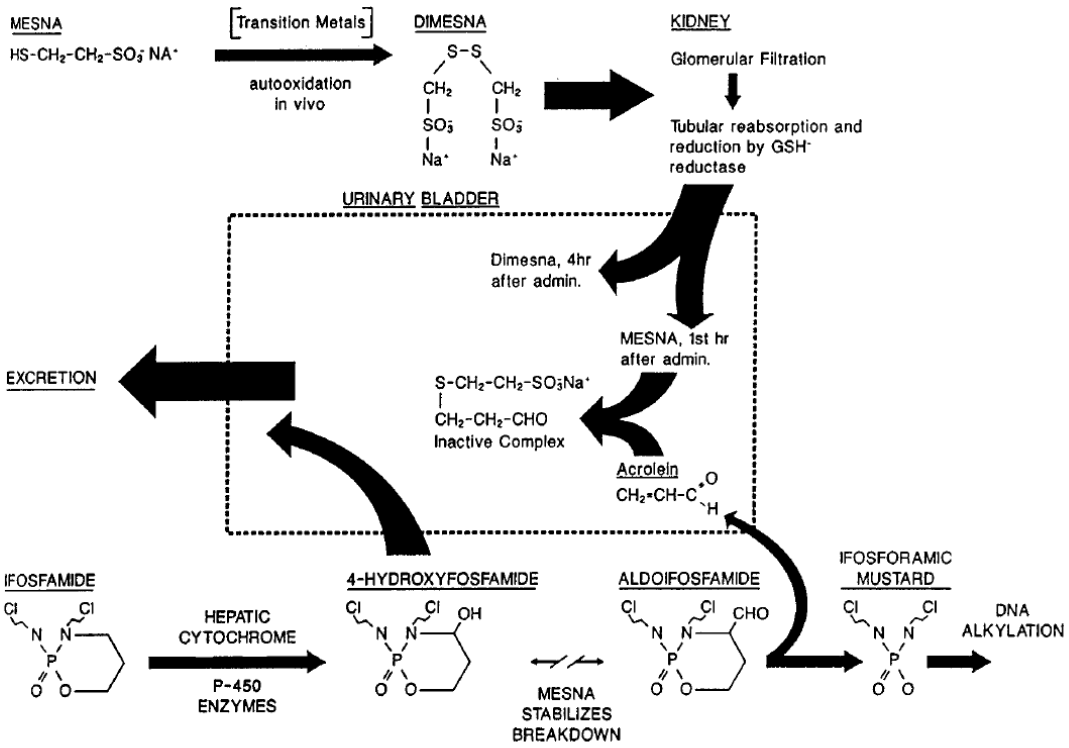

Tableau clinique

- hématurie
- caillotage vésical avec rétention urinaire
- douleurs : cystalgies
- choc hémorragique

Table 4 Complications of severe hemorrhagic cystitis

Complication	*No. patients (n = 92)*	*(%)*
Urinary obstruction	19	20.7
Acute renal failure with dialysis	10	10.7
Acute renal failure without dialysis	9	9.8
Hydronephrosis	9	9.8
Death-related to hemorrhagic cystitis	5	5.4
Bladder perforation	2	2.2

Prévention

(en cas de traitement par cyclophosphamide ou ifosfamide)

- hyperhydratation agressive : obtenir une diurèse d'au moins 200 ml/h
- irrigation vésicale : à raison de 1 l de NaCl 0,9 % par heure via une sonde urinaire à 3 voies jusqu'à 24 h après la fin du traitement
- Uromitexan^{R} (mesna) : 100 à 160 % de la dose de cyclophosphamide ou d'ifosfamide en commençant à t 0 et en fractionnant toutes les 3 à 4 h 3 ou 4 x ou en faisant un bolus (20 à 40 % DT) à t 0 puis infusion continue sur 24 h

Traitement

- corriger les éventuels troubles de coagulation
- en cas d'origine virale : discuter cédofovir (HPMPC) 5 mg/kg à infuser en 1 h
- lavages vésicaux
- diurèse forcée
- reprise mesna (?)
- cautérisation par voie cytoscopique, coagulation par instillation de formol ou de solution à 1% d'alun
- en dernier recours : envisager cystectomie

Insuffisance rénale aiguë

Stratégie diagnostique

1. Rechercher une cause postrénale

par obstruction des voies excrétrices :

- uretères : lymphomes, tumeurs pelviennes, métastases rétropéritonéales, fibrose rétropéritonéale, caillots, lithiases
- rétention vésicale : cancer pelvien, maladie prostatique

→ ex. clinique : TV, TR, globe vésical

échographie des voies rénales

UPR, CT scan abdomen

2. Diagnostic différentiel entre une insuffisance prérénale (“fonctionnelle”) et rénale aiguë

	prérénal	**rénal**
U Na (mEq/l)	< 20	> 40
U Cl (mEq/l)	< 20	> 40
U Osm (mOsm/kg H_2O)	> 450	< 350
U/P Osm	> 1,5	< 1,1
U/P créatinine	> 30 - 40	< 20
U/P urée (! hypercatabolisme)	> 3 (8)	
UNa/ (Ucr/Pcr)	< 1	> 1
Fe Na (% = $\frac{UNa/PNa}{UCr/PCr}$ x 100)	< 1 %	> 1 %
urémie/créatininémie	> 40	
sédiment urinaire	normal	protéinurie, cellules, cyclindres

IRA fonctionnelles: mécanismes

= baisse du débit de filtration glomérulaire secondaire à la survenue d'anomalies hémodynamiques intrarénales sans que ne se constituent ou se surajoutent des lésions anatomiques

Insuffisance rénale aiguë fonctionnelle

- hypovolémie aiguë (vraie ou relative) : hémorragies, déshydratations, 3e espace, hypoalbuminémie sévère, sepsis
- altération des performances cardiaques : décompensation cardiaque, tamponnade
- syndrome hépatorénal
- troubles hémodynamiques intrarénaux d'origine médicamenteuse (favorisés par hypovolémie : cf. diurétiques) : AINS, IEC

3. Causes de l'insuffisance rénale aiguë organique

Cancer-related injury

Tumor infiltration of the kidneys

Obstructive nephropathy related to retroperitoneal lymphadenopathy

Lysozymuria (CMML or AML) with direct tubular injury

Hemophagocytic lymphohistiocytosis with acute interstitial disease

Vascular occlusion associated with DIC and hyperleukocytosis (rare)

Hypercalcemia with hemodynamic acute kidney injury and acute nephrocalcinosis

Glomerular diseases (minimal change disease, focal segmental glomerulosclerosis, membranoproliferative glomerulonephritis, membranous nephropathy, amyloidosis, immunotactoid glomerulonephritis, fibrillary glomerulonephritis, crescentic glomerulonephritis)†

Therapy-related injury

Nephrotoxicity (including thrombotic microangiopathy, acute tubular injury, tubulointerstitial nephritis, and glomerular disease)

Tumor lysis syndrome with acute uric acid nephropathy (may occur spontaneously)

Intratubular obstruction from medications (e.g., methotrexate)

Other types of injuries

Volume depletion

Sepsis and septic shock

Nephrotoxicity of radiocontrast agents

Nephrotoxicity of common medications, such as NSAIDs, ACE inhibitors, ARBs, and antibiotics

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DOI: 10.1056/NEJMra1613984

A. Insuffisance rénale aiguë d'origine tumorale

- infiltration néoplasique des deux reins (très rare) : surtout dans les leucémies et lymphomes, tout-à-fait exceptionnelle dans les tumeurs solides
- glomérulopathies : soit paranéoplasique, soit par sécrétions de substances toxiques (lysozyme)
- à l'origine de dépôts : amyloïdose, dysglobulinémies

B. Syndromes de précipitations intratubulaires

tableau de néphropathie obstructive intrarénale :

- cristaux d'acide urique ou de phosphate de calcium dans le syndrome de lyse tumorale
- paraprotéines dans le myélome multiple et les dysglobulinémies paranéoplasiques
- phosphate de calcium dans l'hypercalcémie
- méthotrexate lors de traitements par hautes doses de ce médicament

C. Toxicités médicamenteuses

- cisplatine : insuffisance rénale qui tendra à être chronique; néphropathie à perte de sels par atteinte tubulaire
- autres agents cytotoxiques: nitrosourées, ifosfamide, mitomycine C, méthotrexate, interleukine 2, interférons, thérapies ciblées, immunothérapies
- divers: antibiotiques, produits de contrastes iodés

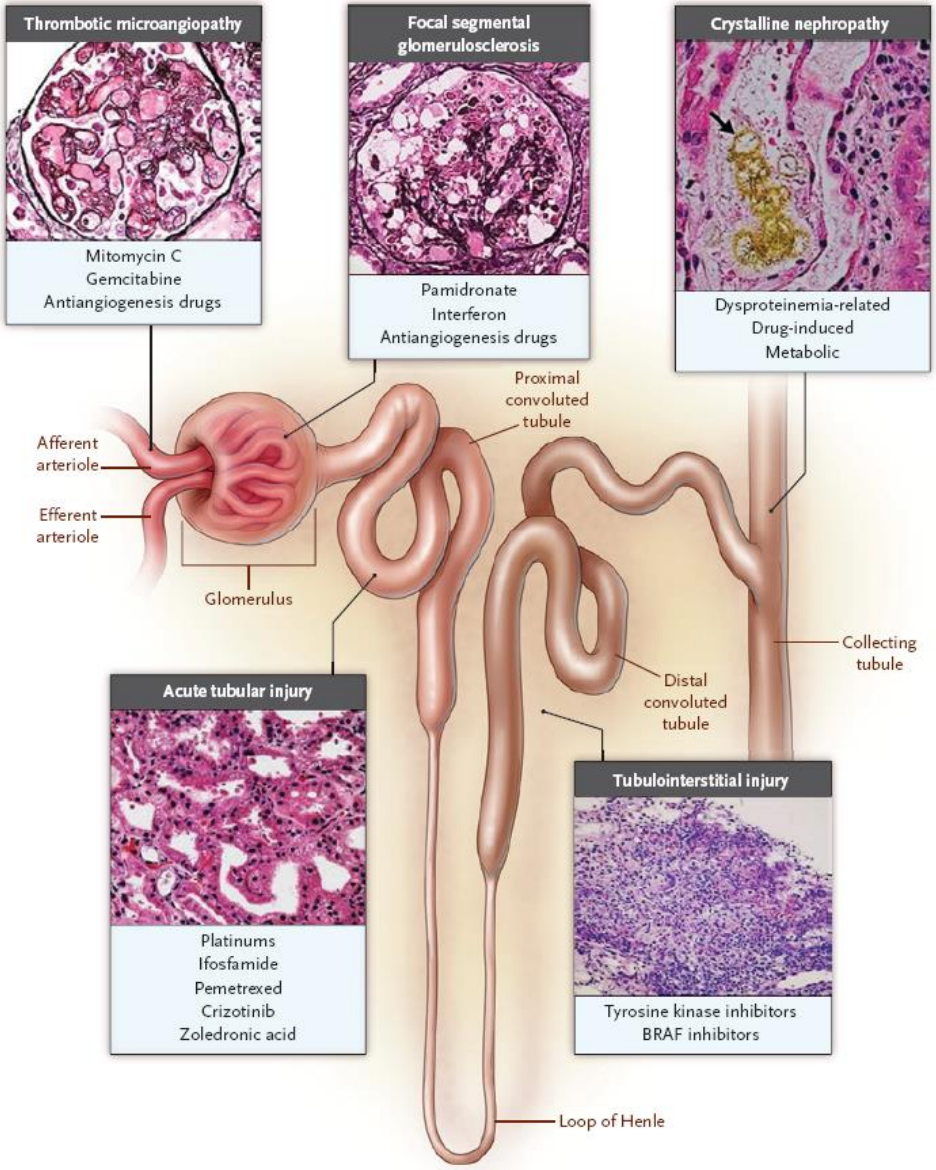

Figure 2. Anticancer Therapies and Their Site of Action in the Nephron.

Table 3. Common Anticancer Drugs Associated with Acute Kidney Injury.*

Medication	Mechanism of Action	Renal Histopathological Features	Clinical Nephrotoxic Effects
Chemotherapeutic agents			
Cisplatin†	Cross-linking and interference with DNA replication	Acute tubular injury and acute tubular necrosis	Acute kidney injury, proximal tubulopathy, Fanconi's syndrome, NDI, sodium and magnesium wasting
Ifosfamide	Nitrogen mustard alkylating agent; inhibition of DNA synthesis through DNA strand-breaking effects	Acute tubular injury and acute tubular necrosis	Acute kidney injury, proximal tubulopathy, Fanconi's syndrome, NDI
Pemetrexed	Antifolate agent; inhibition of dihydrofolate reductase, thymidylate synthase, and glycinamide ribonucleotide formyltransferase	Acute tubular injury and acute tubular necrosis	Acute kidney injury, proximal tubulopathy, Fanconi's syndrome, NDI
Methotrexate	Antifolate agent; inhibition of dihydrofolate reductase	Crystalline nephropathy and acute tubular injury	Acute kidney injury
Pamidronate	Pyrophosphate analogue; associated with moderate FPPS inhibition	Focal segmental glomerulosclerosis, acute tubular injury	Nephrotic syndrome, acute kidney injury
Zoledronic acid	Pyrophosphate analogue; associated with potent FPPS inhibition	Acute tubular injury and acute tubular necrosis	Acute kidney injury
Targeted agents			
Anti-VEGF drugs	VEGF-receptor antibody or soluble receptor; inhibition of VEGF signaling	Thrombotic microangiopathy	Acute kidney injury, proteinuria, hypertension
Tyrosine kinase or multikinase inhibitors (sunitinib, sorafenib, pazopanib)	Inhibition of tyrosine kinase or multikinase signaling, with activity against RAF kinase and several receptor tyrosine kinases (e.g., VEGF, PDGF)	Thrombotic microangiopathy, focal segmental glomerulosclerosis, tubulointerstitial nephritis	Acute kidney injury, proteinuria, hypertension
BRAF inhibitors (vemurafenib and dabrafenib)	Inhibition of the mutated BRAF V600E kinase that leads to reduced signaling through the aberrant MAPK pathway	Acute tubular injury, tubulointerstitial nephritis	Acute kidney injury, electrolyte disorders
ALK inhibitors (crizotinib)	Inhibition of the mutated anaplastic lymphoma kinase	Acute tubular injury, tubulointerstitial nephritis	Acute kidney injury, electrolyte disorders, renal microcysts
Immunotherapeutic agents			
Interferons	Activation of STATs, which are transcription factors that regulate immune system gene expression	Thrombotic microangiopathy, focal segmental glomerulosclerosis	Acute kidney injury, nephrotic proteinuria
CTLA-4 inhibitors	T-cell activation by antibody blocking CTLA-4 receptor	Tubulointerstitial nephritis, lupuslike glomerulonephritis‡	Acute kidney injury, proteinuria
PD-1 inhibitors	T-cell activation by antibody blocking PD-1 receptor	Tubulointerstitial nephritis‡	Acute kidney injury
Chimeric antigen receptor T cells	T-cell targeting of specific tumor-cell antigens	No pathological features described	Capillary leak syndrome with prerenal acute kidney injury

* CTLA-4 denotes cytotoxic T-lymphocyte antigen 4, FPPS farnesyl pyrophosphate synthase, MAPK mitogen-activated protein kinase, NDI nephrogenic diabetes insipidus, PD-1 programmed death 1, PDGF platelet-derived growth factor, STAT signal transducer and activator of transcription, and VEGF vascular endothelial growth factor.
† Carboplatin and oxaliplatin are less nephrotoxic than cisplatin.
‡ In some cases, tubulointerstitial nephritis is accompanied by granulomatous interstitial nephritis.

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DOI: 10.1056/NEJMra1613984

Table 1. Summary of Renal Effects of Immune Checkpoint Inhibition.*

Variable	CTLA-4 Antagonists	PD-1 Inhibitors
Most common toxicity	Acute interstitial nephritis reported in 10 patients	Acute interstitial nephritis reported in 16 patients and in 6 patients receiving combination CTLA-4 therapy
Timing of onset	6 to 12 wk after initiation; late onset related to severe acute kidney injury associated with need for dialysis	3 to 12 mo after initiation
Glomerular findings	Membranous nephropathy in 1 patient, thrombotic microangiopathy in 1 patient, and minimal change disease in 2 patients	Minimal change disease in 1 patient and IgA nephropathy in 1 patient
Outcomes after kidney transplantation	No transplant rejection reported in 2 patients	Transplant rejection reported in 7 of 10 patients, including 3 who had received combination therapy with CTLA-4 antagonists

DOI: 10.1056/NEJMc1801663

Toxicité rénale des thérapies ciblées : multiples atteintes potentielles

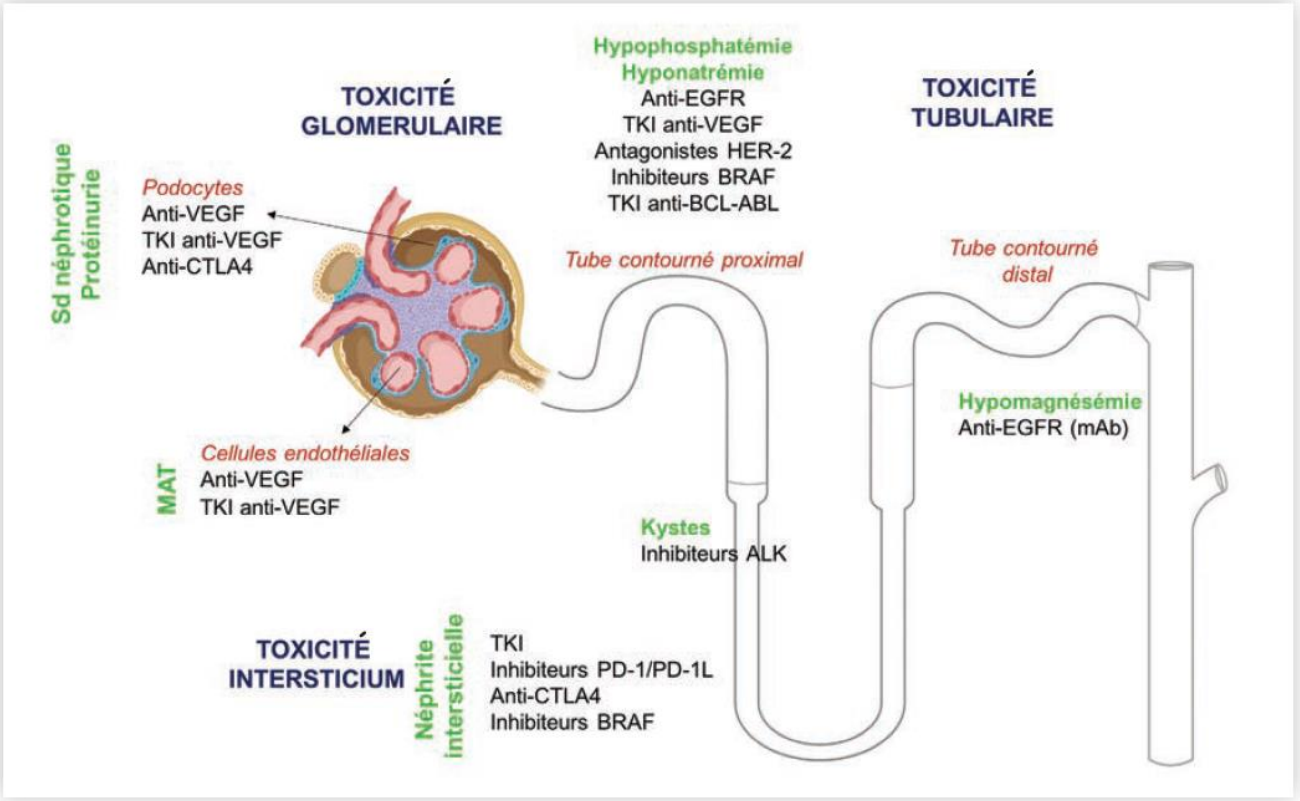

Figure 2. Localisation des toxicités des thérapies ciblées dans le néphron. ALK : *anaplastic lymphoma kinase* ; BRAF : *B-Raf* proto-oncogène ; CTLA4 : *cytotoxic T lymphocyte antigen-4* ; EGFR : *epidermal growth factor receptor* ; HER : *human epidermal growth factor receptor-2* ; mAb : anticorps monoclonal ; MAT : microangiopathie thrombotique ; PD-1 : *programmed death-1* ; PD-1L : *programmed death-ligand 1* ; Sd : syndrome ; TKI : *tyrosine kinase inhibitor* ; VEGF : *vascular endothelium growth factor.*

Table 2
Recommended dosage adaptation for anticancer drugs in case of renal insufficiency, adapted from SIOG recommandations [36].

Drugs (iv)	Dose based on patient's creatinine clearance (ml/min)			
	90–60	60–30	30–15	<15
Cisplatin (mg/m^2)	50–120	NR	NR	NR
Carboplatin	Adjust according to the Calvert formula			
Methotrexate (mg/m^2)	30–50	24–40	15–25	CI
Pemetrexed (mg/m^2)	500	>40–45: 500 <40–45: CI	CI	CI
Raltitrexed (mg/m^2)	3 q 3 weeks	65–55: 2.25 q 4 weeks 54–25: 1.5 q 4 weeks <25: CI		CI
Ifosfamide (g/m^2/day) (TD per cycle)	1.5–3 (5–10)			1.13–2025 (3.75–7.5)
Etoposide (mg/m^2)	50–150 day 1–3	37.5–112.5 day 1–3		25–75 day 1–3
Topotecan (mg/m^2)	1.5/day	60–40: 1.5/d 39–20: 0.75/day		Unknown
Gefitinib (mg/day)	250	Avoid if <20 ml/min; otherwise 250		NR
Erlotinib (mg/day)	150	150		NR
Crizotinib (mg/day)	250 bid	250 bid if creat Cl > 30 ml/min 250 once daily if < 30 ml/min		
Afatinib (mg/d)	No modification of the starting dose for Cl creat > 30 ml/min; no data for Cl creat < 30 ml/min			

NR: Not recommended; CI: contra-indicated; d: day; Cl: clearance.

D. Syndrome hémolyse-urémie

aussi appelé

- *purpura thrombotique thrombocytopénique*
- *anémie hémolytique microangiopathique*

E. Nécrose tubulaire aiguë

- hypovolémie aiguë : hémorragie, déshydratation, troisième espace, sepsis, choc
- altération des performances cardiaques : décompensation cardiaque, tamponnade
- syndrome hépatorénal
- troubles hémodynamiques intrarénaux d'origine médicamenteuse : AINS, IEC
- médicaments : aminoglycosides, amphotéricine B, contrastes iodés, cisplatine …
- rhabdomyolyse et hémolyse intravasculaire
- lysozyme (leucémie aiguë monoblastique)

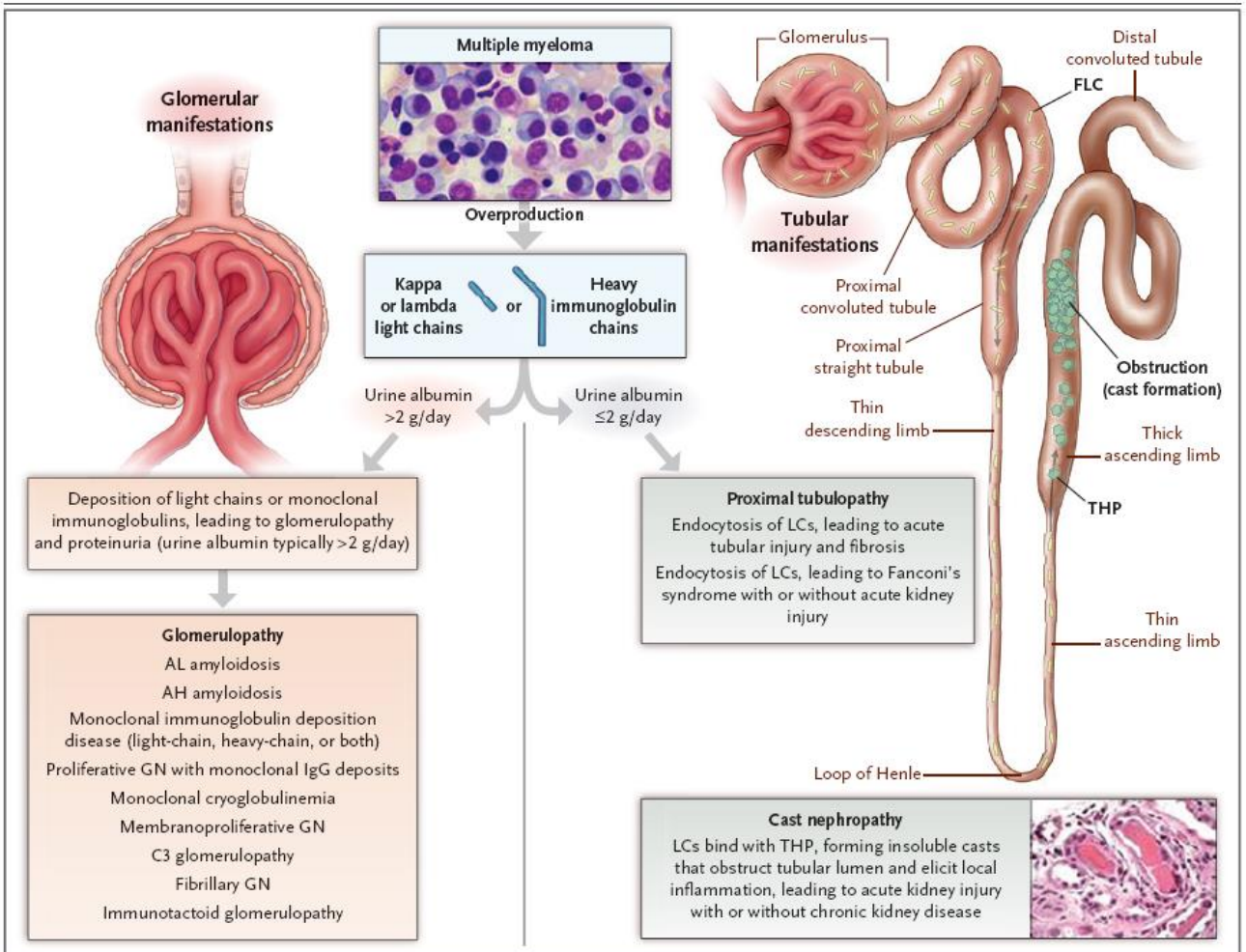

Figure 1. Diagnostic Approach to Patients Presenting with Acute Kidney Injury and Suspected Myeloma.

In patients with multiple myeloma, various glomerular and tubular manifestations can develop. Either isolated light (kappa or lambda) or heavy immunoglobulin chains can lead to injury. Patients with urine albumin levels higher than 2 g per day usually have one of a variety of glomerular lesions, whereas patients with lower urine albumin levels usually have a proximal tubulopathy or cast nephropathy. The stains are Wright–Giemsa (multiple myeloma) and hematoxylin and eosin (cast nephropathy). AH denotes amyloid heavy chain, AL amyloid light chain, FLC free light chain, GN glomerulonephritis, LC light chain, and THP Tamm–Horsfall protein.

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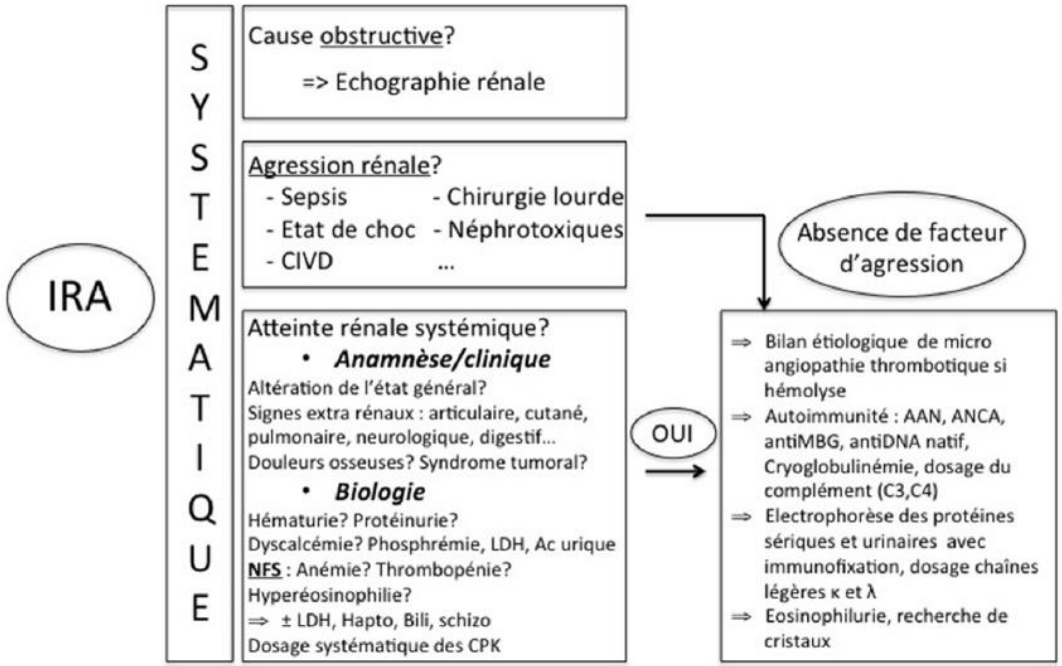

Fig. 1 Stratégie diagnostique devant une insuffisance rénale aiguë chez le patient de réanimation IRA : insuffisance rénale aiguë ; CIVD : coagulation intravasculaire disséminée ; LDH : lactate déshydrogénase ; CPK : créatine phosphokinase ; AAN : anticorps antinucléaires ; ANCA : anticorps anticytoplasme des polynucléaires neutrophiles ; anti-MBG : anticorps antimembrane basale glomérulaire

Stratégie thérapeutique

- Traitement étiologique
- Traitement de soutien
- Épuration extrarénale

Données spécifiques sur l'EER

L'EER est efficace

Support Care Cancer (2004) 12:306–311
DOI 10.1007/s00520-003-0588-8

ORIGINAL ARTICLE

T. Berghmans
A. P. Meert
E. Markiewicz
J. P. Sculier

Continuous venovenous haemofiltration in cancer patients with renal failure: a single-centre experience

Table 1 Characteristics of the 32 eligible cancer patients treated by continuous venovenous hemodiafiltration (CVVHDF) for acute renal failure

Patients characteristics	Number
Gender (male/female)	23/9
Median age (range)	61 (33–84)
Causes of admission to ICU	
Renal failure	17
Respiratory	11
Cardiovascular complications	1
Infectious disease	3
General gravity scores: median (range)	
APACHE II	31 (19–44)
IGS II	67 (31–103)
Number of organ failures (including kidney)	
1	10
2	6
3	13
4	2
pH (median/range)	7.34 (7.11–7.47)
Creatinine (median/range) (μmol/l)	424.3 (194.5–1290.6)
Potassium (median/range) (mEq/l)	4.1 (3.3–7.4)

Table 2 Cancer characteristics in 32 patients with acute renal failure

Patients characteristics	Number
Haematological malignancies	16
Acute myeloid leukemia	3
Acute lymphoblastic leukemia	2
Chronic leukemia	5
Lymphoma	3
Myelodysplasia	2
Multiple myeloma	1
Solid tumours (limited/metastatic)	12/4
Lung	4
Digestive tract	5
Bladder	3
Other	4
Cancer status	
Remission complete/partial	8/2
No change	2
Progressive disease	6
Induction treatment	14
Neoplastic disease phase	
Diagnostic	3
Curative	17
Controllable	12

Table 3 Results of univariate prognostic factors analysis included in the multivariate models for hospital mortality

	Dead during hospital stay		*P* value
	Yes	No	
Haematological malignancies (*n*)	11	5	0.08
Solid tumours (*n*)	6	10	-
Immunosuppressed (*n*)	14	8	0.08
Others (*n*)	3	7	-
Renal failure aetiology (*n*)	-	-	0.01
Renal (*n*)	17	10	-
Other (*n*)	0	5	-
Bone marrow transplantation (*n*)	8	1	0.01
Others (*n*)	9	14	-
Number of organ failures	-	-	0.0001
1	0	10	-
>1	16	5	-
Age (median-years)	56	65	0.03
APACHE II	34	25	0.006
IGS II	76	47	0.01
ARDS (*n*)	7	0	0.005
No ARDS (*n*)	10	15	-
Mechanical ventilation (*n*)	12	3	0.004
No mechanical ventilation (*n*)	5	12	-
Systolic blood pressure (median mm Hg)	115	149	0.09
Neutrophil count (median mm^3)	3,205	4,750	0.18
Lymphocyte count (median mm^3)	275	550	0.02
Bilirubin (median μmol/l)	61.6	18.8	0.001
Creatinine (median μmol/l)	318.2	565.8	0.009
Bicarbonate (median mEq/l)	18	20	0.15
Phosphate (median mmol/l)	1.8	2.2	0.16
Thromboplastin time (median INR)	1.4	1.1	0.03

account either APACHE II or IGS II. Only the number of organ failures was found as a statistically significant prognostic factors in the two models (β=–0.79, p=0.009 and β=–0.77, p=0.01), meaning that when only renal failure occurred, the prognosis was better than if other organ failures were associated. None of the ten patients with only renal failure died at the difference of 16 among the 21 patients with more than one organ failure. High phosphate level was also found a significant prognostic factor in the model including APACHE II (β=0.38; p=0.04).

Le pronostic ne dépend pas intrinséquement de l'affection néoplasique sous-jacente

Nephrol Dial Transplant (2005) 20: 552–558
doi:10.1093/ndt/gfh637
Advance Access publication 25 January 2005

Nephrology
Dialysis
Transplantation

Original Article

Outcome in critically ill medical patients treated with renal replacement therapy for acute renal failure: comparison between patients with and those without haematological malignancies

Dominique D. Benoit[1], Eric A. Hoste[1], Pieter O. Depuydt[1], Fritz C. Offner[2], Norbert H. Lameire[3], Koenraad H. Vandewoude[1], Annemieke W. Dhondt[3], Lucien A. Noens[2] and Johan M. Decruyenaere[1]

Department of Internal Medicine, [1]Intensive Care Medicine, [2]Hematology and [3]Renal Divisions, Ghent University Hospital, 9000 Gent, Belgium

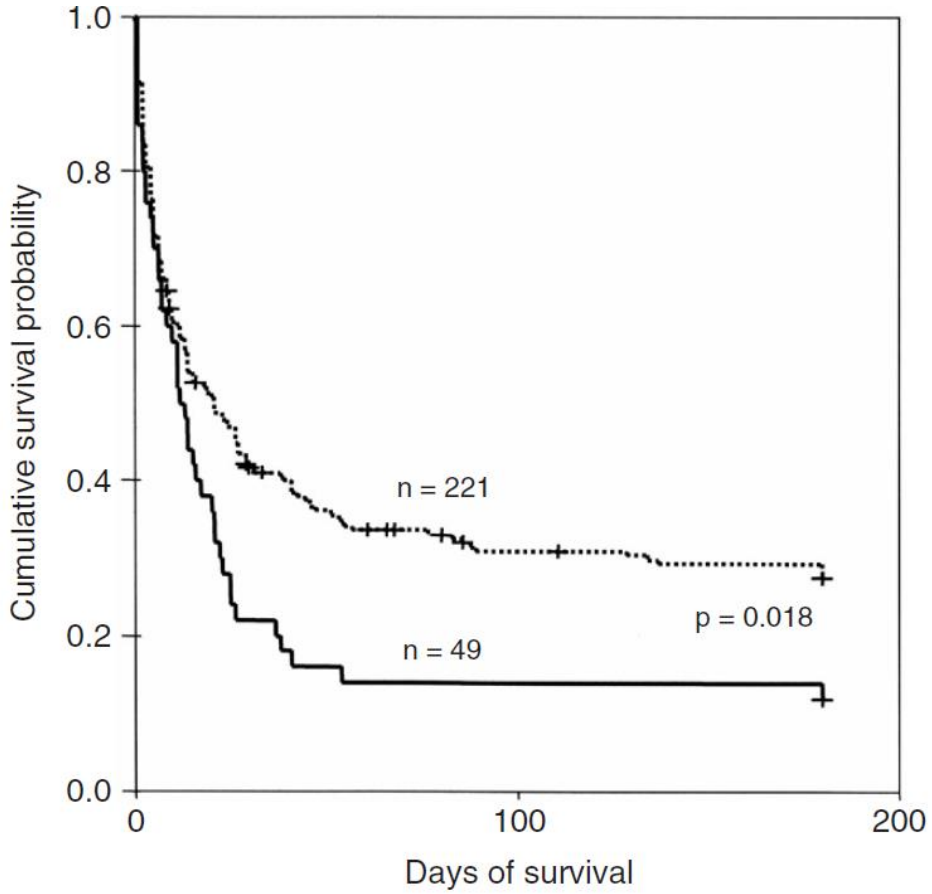

Fig. 1. Kaplan–Meier survival estimates in patients with ($n=49$, solid line) and those without haematological malignancies who received RRT in the ICU ($n=221$, interrupted line).

Table 1. Baseline characteristics and severity of illness in medical ICU patients with and without haematological malignancies who received renal replacement therapy for acute renal failure ($n = 270$)[a]

Variables	Patients with haematological malignancies ($n = 49$)	Patients without haematological malignancies ($n = 221$)	*P*-value
Baseline characteristics			
Gender (male)	31 (63.3%)	135 (61.1%)	0.87
Age (years)	62 (44.1–67.5)	63.3 (52.2–71.7)	0.02
Days of hospitalization before admission	7 (1–21)	0 (0–2)	<0.001
Severity of illness at and during admission			
APACHE II score	30 (23–36)	27 (20–32)	0.019
APACHE II predicted mortality	67.9 (35.3–84.8)	49.5 (24.8–70.3)	0.001
Mechanical ventilation	43 (87.8%)	158 (71.5%)	0.018
Duration of ventilation (days)[b]	10 (2–22)	5 (2–14)	0.063
Vasopressor use	42 (85.7%)	170 (76.9%)	0.248
Use of continuous RRT as initial mode	35 (71.4%)	96 (43.4%)	<0.001
Time from ICU admission to RRT (days)	1 (0–5)	1 (0–4.5)	0.48
Length of stay at the ICU (days)	11 (3–23)	8 (3–20)	0.465

[a]Categorical variables are reported as counts (%) and continuous variables as median (interquartile range).
[b]Among ventilated patients.
The Acute Physiology and Chronic Health Evaluation (APACHE) II score is a severity of illness score. Higher scores indicate a more severe impairment. RRT = renal replacement therapy.

Table 2. Impact of the presence of a haematological malignancy on the outcome in medical ICU patients with acute renal failure who received renal replacement therapy ($n = 270$)[a]

Variables	Univariate		Multivariate	
	HR (95% CI)	*P*-value	HR (95% CI)	*P*-value
Baseline characteristics				
Haematological malignancy	1.52 (1.07–2.13)	0.018	–	0.78
Age >65 years	1.20 (0.09–1.59)	0.21	–	0.093
Hospital stay before admission (per day increase)	1.01 (1.01–1.02)	<0.001	1.02 (1.01–1.03)	<0.001
Severity of illness during admission				
APACHE II score (per point increase)	1.05 (1.03–1.06)	<0.001	1.04 (1.02–1.05)	<0.001
Mechanical ventilation	1.92 (1.35–2.73)	<0.001	–	0.35
Vasopressor use	2.51 (1.65–3.82)	<0.001	2.1 (1.38–3.28)	0.001
Use of continuous RRT as initial mode	2.34 (1.75–3.14)	<0.001		

[a]Results are calculated by Cox proportional hazard models. The hazard ratio (95% confidence interval, *P*-value) for haematological malignancy was 1.28 (0.91–1.85, $P = 0.16$) after adjustment for the APACHE II score and 1.33 (0.93–1.89, $P = 0.12$) after adjustment for the duration of hospitalization before ICU admission.

Confirmé dans une population plus générale

Intensive Care Med (2007) 33:765–772
DOI 10.1007/s00134-007-0579-1

ORIGINAL

Michael Darmon
Guillaume Thiery
Magali Ciroldi
Raphaël Porcher
Benoît Schlemmer
Élie Azoulay

Should dialysis be offered to cancer patients with acute kidney injury?

Table 2 Factors associated with acute kidney injury. *NSAID* non-steroidal anti-inflammatory drug, *ACE* angiotensin-converting enzyme, *DIC* disseminated intravascular coagulation

	Number*
Nephrotoxic agents	39 (41.9)
Vancomycin	24 (25.5)
Aminoglycoside	22 (23.4)
Deoxycholate amphotericin	8 (8.5)
Radiographic contrast agent	4 (4.3)
NSAID	3 (3.2)
ACE inhibitors	2 (2.1)
Methotrexate	2 (2.1)
Cisplatin	1 (1.1)
Sepsis	71 (75.5)
Including septic shock	44 (46.8)
DIC	42 (44.7)
Including malignancy-related DIC	26 (26.7)
Malignancy-related factors	
Acute tumor lysis syndrome	39 (41.5)
Cast nephropathy	10 (10.6)
Infiltration	5 (5.3)
Obstruction	5 (5.3)
Thrombotic microangiopathy	3 (3.2)
Renal amyloidosis	1 (1.1)
Urinary excretion of lysozyme	1 (1.1)
Intravascular hemolysis	1 (1.1)

* Numbers in parentheses are percentages

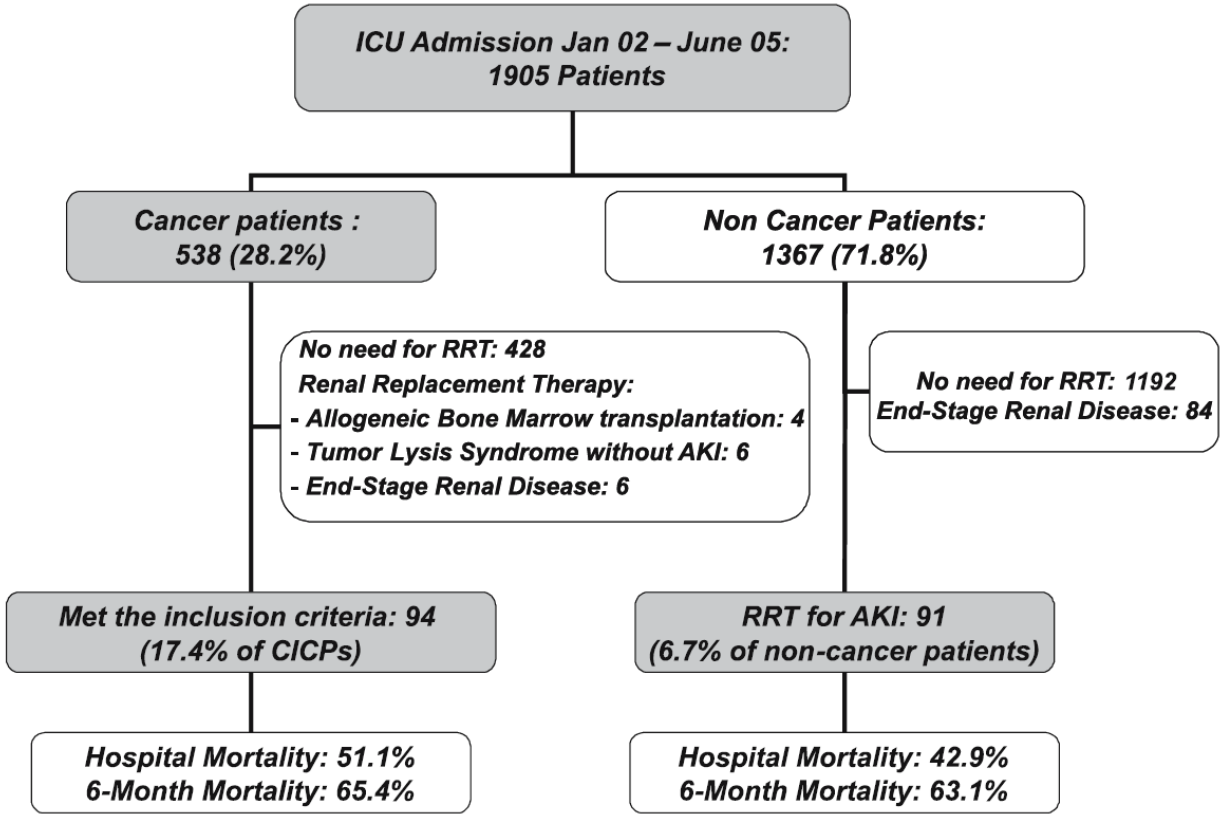

Fig. 1 Flow chart of patients admitted during the study period. The 6-month mortality was calculated on the 78 patients with cancer and 65 patients without cancer who were still available for follow-up. *RRT* renal replacement therapy, *CICPs* critically-ill cancer patients, *AKI* acute kidney injury. End-stage renal disease was defined as previously diagnosed chronic renal failure with an estimated glomerular filtration rate < 15 ml/min)

Table 3 Logistic regression: independent predictors of hospital mortality. [Area under the receiver operating characteristics curve = 0.78 (95% CI, 0.68–0.87); Hosmer–Lemeshow goodness of fit ($\chi^2 = 7.87$; $p = 0.45$)]. *CI* confidence interval, *RRT* renal replacement therapy, *LOD* Logistic Organ Dysfunction score

	Odds ratio	95% CI	*p*-value
Renal function deterioration in the ICU	5.26	1.58-17.52	0.007
Anuria at ICU admission	2.41	0.91-6.42	0.076
LOD (per point)	1.31	1.11-1.55	0.002

Table 4 Comparison between critically ill patients with and without cancer. 6-month mortality was calculated on the 78 patients with cancer and 65 patients without cancer who were still available for follow-up. *SAPS II* Simplified Acute Physiology Score

	Cancer ($n=94$)	No cancer ($n=91$)	p-value
Male gender	73 (77.6%)	58 (63.7%)	0.04
Age (years)	53.5 (41-64)	53 (41-66)	0.32
Knaus C or D [24]	29 (30.8%)	20 (22%)	0.17
SAPS II score at ICU admission	53 (40-75)	46 (38-67)	0.27
Length of ICU stay	9 (4-16)	9 (4-17)	0.54
Reasons for ICU admission			0.59
Medical	93 (98.9%)	89 (97.8)	
Surgical	0	1 (1.1%)	
Surgical emergency	1 (1.1%)	1 (1.1%)	
Hospital mortality	48 (51.1%)	39 (42.9%)	0.3
6-month mortality	51 (65.4%)	41 (63.1%)	0.99
Follow-up (days)	51 (12-215)	19 (7-110)	0.03

Il existe un risque de dialyse chronique

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ORIGINAL REPORT

Prognosis of Critically Ill Patients With Cancer and Acute Renal Dysfunction

Márcio Soares, Jorge I.F. Salluh, Marilia S. Carvalho, Michael Darmon, José R. Rocco, and Nelson Spector

From the Intensive Care Unit, Instituto Nacional de Câncer; Intensive Care Unit, Hospital Barra D'Or; Departamento de Epidemiologia e Métodos Quantitativos, Escola Nacional de

A B S T R A C T

Purpose

To evaluate the outcomes of critically ill patients with cancer and acute renal dysfunction.

Table 3. Main Associated Factors of Acute Renal Dysfunction (N = 309)

	No.	%
Ischemia/shock	223	72
Sepsis	195	63
Radiocontrast/nephrotoxins	49	16
Urinary tract obstruction (cancer related)	23	7
Unilateral nephrectomy (cancer)	12	4
Acute tumor lysis syndrome	10	3
Multiple myeloma	9	3
Rhabdomyolysis	3	1
Unknown/other	15	5

NOTE. A patient could have more than one associated condition.

Table 1. Criteria for the Classification of Acute Renal Dysfunction

ARI	ARFS	Severe ARFS
Creat > 1.44 mg/dL and urea > 48 mg/dL and/or UO <800 mL/d or UO < 200 mL/6 h	Creat > 2.88 mg/dL and urea > 96 mg/dL and/or UO <400 mL/d or UO < 100 mL/6 h	Need for renal replacement therapy and either criteria for ARI or ARFS
If acute on chronic renal dysfunction: An increase in creat of 0.72 mg/dL or in urea of 24 mg/dL and/or <800/d or UO < 200 mL/6 h	*If acute on chronic renal dysfunction:* An increase in creat of 1.44 mg/dL or in urea of 48 mg/dL and/or UO 400 mL/d or UO < 100 mL/6 h	*If acute on chronic renal dysfunction:* Need for renal replacement therapy and either criteria for acute on chronic renal dysfunction for ARI or ARFS

Abbreviations: ARI, acute renal injury; ARFS, acute renal failure syndrome; creat, serum creatinine concentration; urea, serum urea concentration; UO, urine output.

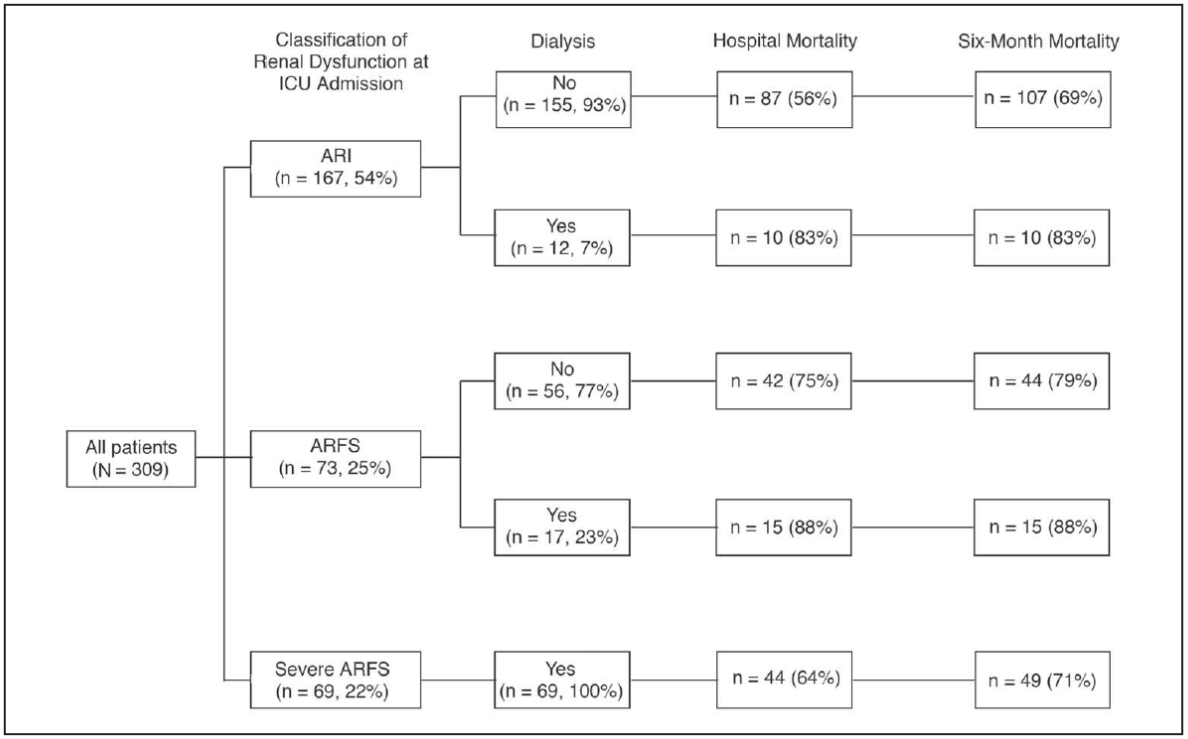

Fig 1. Hospital and 6-month mortality rates according to the initial classification of acute renal dysfunction and temporal indication of dialysis. ICU, intensive care unit; ARI, acute renal injury; ARFS, acute renal failure syndrome.

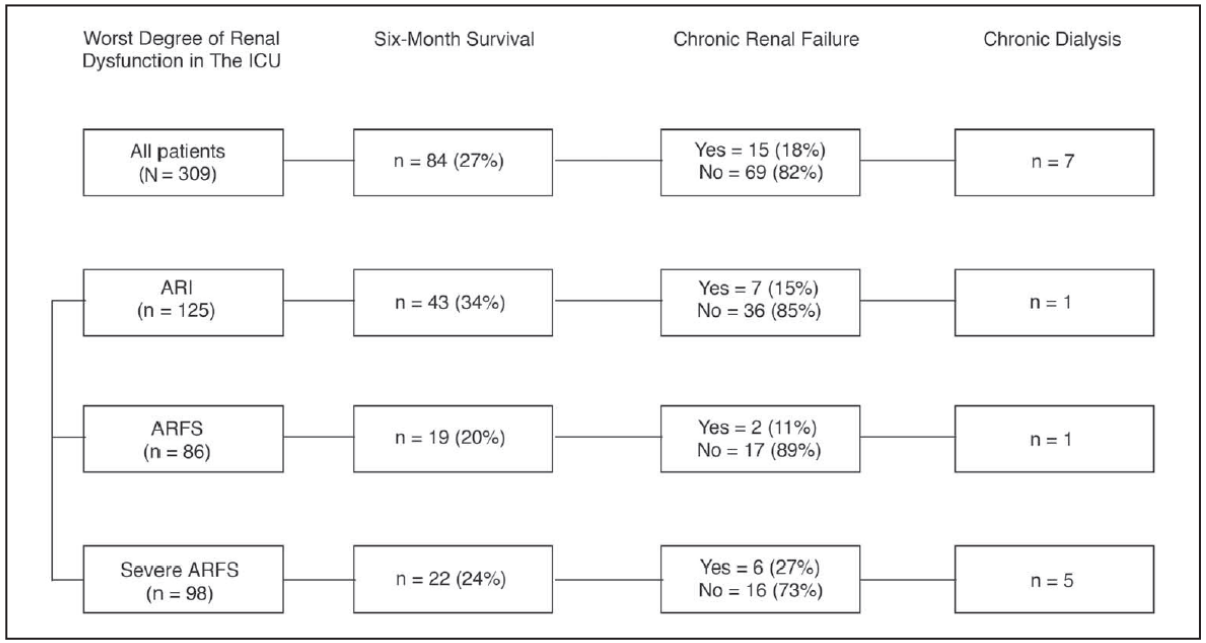

Fig 2. Renal function at 6-months according to the worst classification of acute renal dysfunction during intensive care unit (ICU) stay. ARI, acute renal injury; ARFS, acute renal failure syndrome.

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Continuous Renal Replacement Therapy for Acute Renal Failure in Patients with Cancer: A Well-Tolerated Adjunct Treatment

*Rebecca Fischler, Anne-Pascale Meert, Jean-Paul Sculier and Thierry Berghmans**

Department of Intensive Care and Oncological Emergencies and Thoracic Oncology, Institut Jules Bordet, Université Libre de Bruxelles, Brussels, Belgium

TABLE 1 | Characteristics at ICU admission of 103 patients with cancer with acute renal failure requiring renal replacement therapy.

Sex (male/female)	69/34 (67%/33%)
Age (median/range)	62 years (19–87)
Solid malignancies (locoregional/metastatic)	68 (66%) (28/40)
Breast	7 (7%)
Lung	6 (6%)
Digestive tract	15 (15%)
Prostate/bladder/kidney	23 (22%)
Other	17 (17%)
Hematological malignancies	35 (34%)
Leukemia	10 (10%)
Lymphoma	14 (14%)
Multiple myeloma	9 (9%)
Myelodysplastic syndrome	2 (2%)
Stem cell transplantation before ICU admission (allo/auto)	18 (14/4) (17%)
Cancer phase	
Diagnostic	9 (9%)
Curative	41 (40%)
Controllable	53 (51%)

TABLE 2 | Principal etiologies of acute renal failure in patients admitted in the ICU.

	n	%[a]
Nephrotoxic drugs	48	47
Shock/sepsis	41	40
Acute tubular necrosis[b]	19	18
Cancer	10	10
Tumor lysis syndrome	8	8
MOF	4	4
Hepato-renal syndrome	4	4
Other	12	12
Unknown[c]	6	6

[a]One patient could have had more than one etiological factor: a combination of at least two factors has been seen in 43 patients (42% of the cases).

[b]Acute tubular necrosis except nephrotoxic drugs and shock/sepsis.

[c]No aetiology has been formally identified.

MOF, multiple organ failure.

Results: One hundred and three patients are assessed: men/women 69/34, median age 62 years, solid/hematologic tumors 68/35, median SAPS II 56. Mortality rate was 63%. Seven patients required chronic renal dialysis. After multivariate analysis, two variables were statistically associated with hospital mortality: more than one organ failure (including kidney) (OR 5.918; 95% CI 2.184–16.038; $p < 0.001$) and low albumin level (OR 3.341; 95% CI 1.229–9.077; $p = 0.02$). Only minor complications related to CVVHDF have been documented.

TABLE 4 | Summary of publications assessing renal replacement therapy in patients with cancer admitted into ICU.

Reference	Population	*N*	RRT	Mortality	Prognostic factors for hospital mortality
Mixed population (solid and hematological tumors, including bone marrow transplantation)					
Berghmans et al. (15)	Solid: 50% Hemato: 50% BMT: 28%	32	CVVHDF	ICU: 50% Hospital: 53%	Number of organ failure
Salahudeen et al. (5)	Solid: 38% Hemato: 62% BMT: 18%	199	C-SLED	Day 30: 65%	SOFA score, pH, mean blood pressure
Mixed population (solid and hematological tumors, excluding bone marrow transplantation)					
Maccariello et al. (13)	Solid: 73% Hemato: 27%	118	IRRT daily conventional IRRT daily extended CRRT	ICU: 70% Hospital: 78%	Number of organ failure
Darmon et al. (7)	Solid: 7% Hemato: 78% Other: 15%	94	CRRT IRRT	ICU: 43.6% Hospital: 51.1% 6 months: 65.4%	LOD score, late RRT (>24 h after ICU admission)
Soares et al. (14)	Solid: 75% Hemato: 25%	98	IRRT conventional IRRT extended CRRT	Hospital: 64–86%	–
Hematological tumors					
Letourneau et al. (12)	BMT: 100%	14	CVVHDF IRRT	–	–
Lanore et al. (11)	BMT: 11%	43		ICU: 72%	ARF secondary to sepsis, SAPS score, mechanical ventilation support
Benoit et al. (9)	BMT: 22.4%	50	IRRT CRRT	ICU: 79.6% Hospital: 83.7% 6 months: 86%	–

Conclusions

- Les principaux facteurs pronostiques s'avèrent être le nombre d'insuffisances organiques et le délai entre l'admission à l'USI et le début de la dialyse.
- Les caractéristiques du cancer sous-jacent ne sont pas un facteur indépendant, ni le fait d'être atteint d'un cancer.
- La plupart des patients rescapés récupèrent une fonction rénale normale et peu passent en dialyse chronique.

Le traitement anticancéreux sous EER

Table 3
Anticancer drug treatment adaptation in the patient treated by haemodialysis, adapted from [36–40,46,47,82].

Drugs or regimens	Dose adaptation	Timing of administration	Recommended dosage
Carboplatin	Yes	After HD	Dose = AUC × (25 + 0)
Cisplatin	Yes	After HD	25 mg/m^2
Cyclophosphamide	Yes	After HD	Reduction of 25%
Docetaxel	Yes	Before or after HD	65 mg/m^2
Doxorubicin	No	After HD	Standard dose
Epirubicin	No	After HD	Standard dose
Etoposide	Yes	Before or after HD	Reduction of 50%
Gemcitabine	No	6–12 h before HD	Standard dose
Irinotecan	Yes	After HD	Standard dose
Paclitaxel	No	Before or after HD	Standard dose
Vinorelbine	Yes	After HD	Reduction of 20–33%
Gefitinib	No	Daily	250 mg po daily
Erlotinib	No	Daily	150 mg po daily

HD: Haemodialysis.

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