Open Access Library Journal
2025, Volume 12, e13872
ISSN Online: 2333-9721
ISSN Print: 2333-9705

# Plasma Exchange during Extracapillary Glomerulonephritis at the Centre Hospitalier South Francilien, France

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**How to cite this paper:** Diallo, A.Y., Sandouno, F.A., Barry, K.M.B., Bangoura, S., Camara, M.L.T., Diallo, M.M., Baldé, M.S., Diakité, F., Pière, H., Latifa, H. and Kaba, M.L. (2025) Plasma Exchange during Extracapillary Glomerulonephritis at the Centre Hospitalier South Francilien, France. *Open Access Library Journal*, **12**: e13872.
https://doi.org/10.4236/oalib.1113872

**Received:** June 28, 2025
**Accepted:** August 9, 2025
**Published:** August 12, 2025



## Abstract

**Objective:** To describe the clinical manifestations, anatomopathology and therapeutic management of patients. **Methodology:** This was a retrospective prospective descriptive and analytical study of ten (10) patients followed from November 2017 to September 2024 in the nephrology department of the Centre Hospitalier South Francilien for GNEC. All patients who underwent renal puncture-biopsy with confirmation of extracapillary glomerulonephritis (ECG) were included. **Results:** During the course of our study, we collected 10 cases of GNEC that had benefited from plasma exchange. The mean age of our patients was 64.7 years, with extremes of 33 and 83 years. There was parity between the sexes, with a sex ratio (M/f) = 1. The circumstances of discovery were dominated by respiratory and renal manifestations, with a frequency of 80%, followed by digestive manifestations (50%). Associated comorbidities were dominated by hypertension and diabetes mellitus in 60% and 40% respectively. Two (2) or 20% of patients had creatinine levels below 500 µmol/l on admission, compared with 8 or 80% who had creatinine levels above 500 µmol/l on admission. The mean creatinine level was 726 µmol/l on admission, compared with 251 µmol/l after treatment, for a total reduction of more than 50% in 8 out of 10 patients. The etiology of GNEC was dominated by anti MPO/PR3 ANCA vasculitis in 50% of cases, anti MBG ANCA vasculitis in 30% followed by IgA nephropathy and Cryoglobulinemia in 10% each. All our patients benefited from immunosuppression and corticosteroid boluses. Five patients benefited from hemodialysis. **Conclusion:** GNEC is a serious condition, not uncommon in our setting. The most frequent mode of onset was GNRP. The vital

prognosis of this pathology remains unfavorable without treatment. Early detection and appropriate management by qualified medical staff could considerably reduce the morbidity and mortality associated with this disease.

## Subject Areas

Nephrology

## Keywords

Extra-Capillary Glomerulonephritis, Plasma Exchange, Southern Ile-De-France

## 1. Introduction

Plasma exchange is an extrarenal purification technique that allows the removal of large quantities of plasma, compensated by substitute solutes. It thus enables rapid purification of high-molecular-weight pathogenic substances that are inaccessible to conventional hemodialysis techniques.

The term plasmapheresis refers to all apheresis techniques that remove plasma from the body: plasma exchange, double filtration cascade and immunoabsorption [1].

In their clinical practice, nephrologists are often faced with prescribing plasma exchange, which always represents a technical and logistical challenge. A good knowledge of the most common indications is therefore essential [2].

According to the French Hemapheresis Registry, PE complications are relatively rare. The level of evidence for the efficacy of PE in nephrology varies from one pathology to another. Goodpasture's syndrome, neutrophil cytoplasm antibody vasculitis when plasma creatinine is above 500 µmol/l, and thrombotic microangiopathies represent the best indications for PE in nephrology [3].

Extracapillary glomerulonephritis (ECG) is also referred to as "rapidly progressive glomerulonephritis" (RPG), due to the rapid deterioration of renal function over a period of weeks to months, often indicative of ECG as a result of crescentic necrotizing extracapillary proliferative glomerulonephritis. Early diagnosis and treatment improve prognosis, as the best prognostic marker is creatinine at the start of treatment [4].

In addition to clinical and laboratory renal signs, GNEC can also be revealed by extra-renal signs. The diagnosis of GNEC is purely histological, and is made when more than 50% of glomeruli contain crescents formed by at least two layers of cells partially or totally filling Bowman's space [4].

Anatomo-pathological study in IF also enables GNEC to be classified into 3 anatomopathological types, thus orienting the etiology involved.

The challenge with GNEC is to identify the underlying etiology, which often requires further investigation (immunological and radiological tests, etc.) before appropriate treatment can be instituted. Although treatment is etiological, it is essentially based on immunosuppression.

Extra-capillary glomerulonephritis (ECG) is a diagnostic and therapeutic emergency. Prognosis depends on prompt treatment. In Black Africa, few data are available on this lesion [5].

The aim of this study was to describe the clinical manifestations, anatomopathology and therapeutic management of these patients.

## 2. Patients and Methods

This was a retrospective prospective descriptive and analytical study of ten (10) patients followed from November 2017 to September 2024 in the nephrology department of the Centre Hospitalier Sud Francilien for GNEC. All patients who underwent renal puncture-biopsy with confirmation of extracapillary glomerulonephritis (ECG) were included.

### 2.1. Variables Studied

**Demographic:** age and sex, marital status.

**Clinical**: comorbidities, medical and toxic history, clinical manifestations on admission.

**Biological**: admission work-up including blood and urine ionograms, creatinine levels with creatinine clearance according to MDRD formula, protidemia, albuminemia, urine sediment, blood count, ECBU (hematuria and leukocyturia).

**The etiological workup was based on:**

Immunological workup (AAN, anti-DNA, ANCA, anti-MBG antibodies, C3 and C4 assay), infectious workup (ENT examination, chest X-ray, echocardiogram, serologies: HIV, HVB, HVC and syphilitic), antiPLA2R Ac.

**The histological diagnosis was based on:**

Anatomopathological examination of renal parenchyma obtained by PBR. The histological features studied were: extracellular proliferation affecting more than 50% of glomeruli, signs of chronicity: presence of PAC, interstitial fibrosis. The IF study confirmed the diagnosis.

**Therapeutic modalities:**

The treatment protocol adopted in the Nephrology Department.

It comprises two components.

An induction treatment and a maintenance treatment.

**Induction treatment:**

### 2.2. Corticosteroids

IV bolus of methylprednisolone at a dose of 7.5 to 15 mg/kg/d for 3 days, followed by oral methylprednisolone, not forgetting adjuvant therapy.

Corticosteroids are tapered according to the following protocol: 1 mg/kg/d at 1 week; 0.5 mg/kg/d at 2 weeks; 0.4 mg/kg/d at 3 weeks; 0.33 mg/kg/d at 6 weeks; 0.25 mg/kg/d at 8 weeks; 15 mg/d at 16 weeks; 10mg/d at 6 months.

**Plasma exchange:** Used in patients with creatinine levels above 500 µmol/l, requiring dialysis and/or with alveolar haemorrhage and hypoxia.

**Immunosuppressants:** Administered as IV boluses, either cyclophosphamide or rituximab according to the RAVE protocol combined with accompanying measures (Bactrim, paracetamol, polaramine) with monitoring of CD19/CD20.

**Extrarenal purification (hemodialysis**): Used in cases of dialysis emergency, including: signs of uremic intolerance, creatinine above 500 µmol/l, urea above 30 mmol/l, hyperkalaemia, severe metabolic acidosis, life-threatening hyperkalaemia, 72-hour anuria, uraemic pericarditis, diuretic-resistant acute pulmonary oedema, GNEC refractory to treatment with immunosuppressants (Rituximab and/or cyclophosphamide).

### 2.3. Definitions Used

**Complete remission**: defined by disappearance of all clinical signs of the disease, normalization or return to baseline of serum creatinine and proteinuria less than or equal to 0.5 g/24h, negative hematuria and leukocyturia.

**Partial remission**: is defined by a reduction and/or stabilisation of serum creatinine and proteinuria to more than 50% below the threshold for nephrotic syndrome, without reaching a value of less than 0.5 g/24 hours.

**Worsening**: is defined as no improvement, worsening of symptoms and/or progression to CKD (renal death).

**Partial remission**: is defined by improvement in clinical signs of the disease, improvement or stabilization of serum creatinine and reduction of proteinuria by more than 50% below the threshold for nephrotic syndrome, without reaching a value of less than 0.5 g/24h.

Worsening: is defined as no improvement, worsening of symptoms and/or progression to CKD (renal death).

**Statistical analysis**: statistical analysis of the various data was performed using SPSS version 2.0 software. Qualitative variables will be described in terms of frequency and percentage, and the comparative study will be performed using the chi-square test. Quantitative variables with a Gaussian distribution are expressed as mean and standard deviation, and are compared using the Student's t-test. Quantitative variables with non-Gaussian distribution are expressed as median and interquartile range. The difference is considered significant when the P value is less than 0.05.

### 2.4. Ethics

With regard to ethical considerations, data collection was carried out with respect for patient anonymity and confidentiality.

**Limitations:** concerned the small sample size.

## 3. Results

In the course of our study, we documented 10 cases of GNEC who had benefited from plasma exchange.

- The mean age of our patients was 64.7 years, with extremes of 33 and 83 years.

This result is in line with European data, where the average age of patients is around 60.

- We noted parity between the sexes, with a sex ratio (M/f) = 1.
- Associated comorbidities were dominated by hypertension and diabetes mellitus in 60% and 40% respectively (see Table 1).
- The circumstances of discovery were dominated by respiratory and renal manifestations with a frequency of 80% each, followed by digestive manifestations 50%. This result shows that renal signs are not always in the foreground during GNEC, with a frequency of 80% (see Figure 1).
- The etiology of extra-capillary glomerulonephritis was dominated by anti MPO/PR3 ANCA vasculitis in 50% of cases, anti MBG ANCA vasculitis in 30% of cases followed by IgA nephropathy and Cryoglobulinemia in 10% each (see Figure 2).
- We did not find a statistically significant correlation between the fall in creatinine levels and the results of renal histology (see Table 2).
- According to therapeutic data, all our patients benefited from immunosuppression and corticosteroid boluses.

Five patients benefited from hemodialysis versus five non-hemodialysed patients.

We found a statistically significant correlation between extra-renal purification (hemodialysis) and the fall in creatinine levels (see Table 3).

Table 1. Distribution of patients by socio-demographic parameters and comorbidities.

| Parameters<br>Sociodemographics and comorbidities | WORKFORCE | % |
|---|---|---|
| **Age (years)** | | |
| **<60** | 5 | 50 |
| **≥60** | 5 | 50 |
| **Sex** | 6 | 60 |
| **Male** | 4 | 40 |
| **Female** | 2<br>8 | 20 |
| **Comorbidities** | 1<br>8 | 10 |
| **HTA** | 0<br>10 | 0<br>100 |
| **Yes** | 2<br>8 | 20<br>80 |

## 4. Discussion

In the course of our study, we collected 10 cases of GNEC who had benefited from plasma exchange.

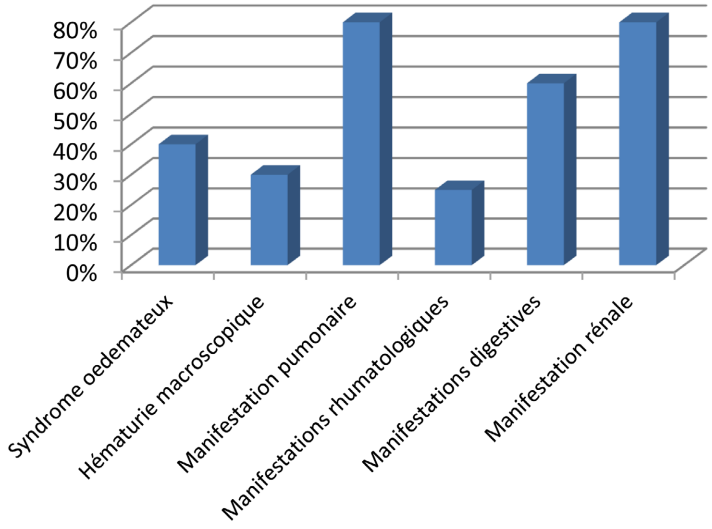


**Figure 1.** Distribution of cases by circumstances of discovery.

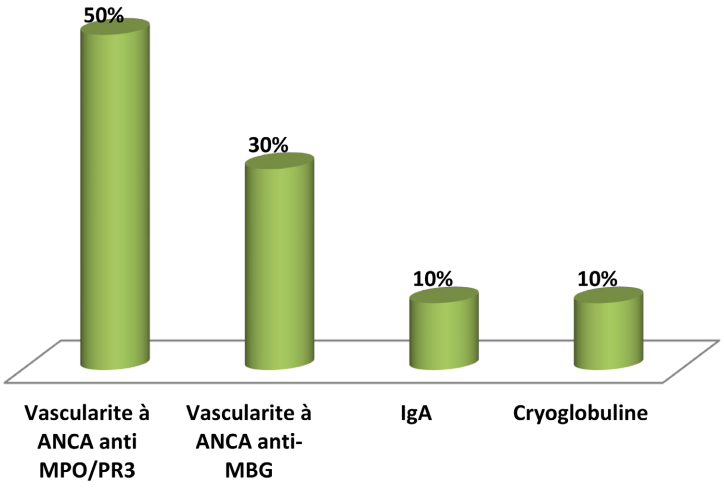


**Figure 2.** Repartition des patients selon l'étiologie.

**Table 2.** Distribution of patients according to histological findings.

| Histological parameters | Reduction in creatinemia | | p | Degree of significance |
|---|---|---|---|---|
| | <50% n: 3 (30%) | >50% n: 7 (70%) | | |
| **Number of glomeruli** | | | | |
| 1 - 15 | 3 (50) | 3 (50) | 0.11 | NS |
| 15 - 30 | 0 (0) | 3 (100) | | |
| **Number of sealing loaves** | | | | |
| 0 - 1 | 1 (33.3) | 2 (66.7) | 0.49 | NS |
| 1 - 8 | 2 (33.3) | 4 (66.7) | | |
| **Number of crescents** | | | | |
| 0 - 5 | 2 (28.6) | −71.4 | 0.33 | NS |

**Continued**

| | | | | |
|---|---|---|---|---|
| 5 - 10 | 1 (50.0) | 1 (50.0) | | |
| **Brinoid necrosis** | | | | |
| Oui | 3 (37.50) | 5 (62.50) | 0.33 | NS |
| Non | 0 (0.0) | 1 (100.0) | | |
| **Infiltra-Inflammatory** | | | | |
| Oui | 2 (28.57) | 5 (71.43) | 0.33 | NS |
| Non | 1 (50) | 1 (50) | | |

**Table 3.** Distribution of patients according to therapeutic data.

| Therapeutic parameters | Reduction in creatinemia | | p | Degree of significance |
|---|---|---|---|---|
| | <50% n: 3 (30%) | >50% n: 7 (70%) | | |
| **Hemodialysis** | | | | |
| Oui | 0 (0) | 5 (100) | 0.04 | S |
| Non | 3 (60) | 2 (40) | | |
| **Corticosteroid bolus** | | | | |
| Oui | 3 (30) | 7 (70) | - | - |
| Non | 0 (0) | 0 (0) | | |
| **Immunosuppression** | | | | |
| Oui | 3 (30) | 7 (70) | - | - |
| Non | 0 (0) | 0 (0) | | |

- The mean age of our patients was 64.7 years, with extremes of 33 and 83 years.

This result is in line with European data, where the average age of patients is around 60 years [6].

We noted a parity of the two sexes with a sex ratio (M/f) = 1.

On the other hand, our result is different from those of Ting Wu *et al.* [7] who had noted a slight male predominance is, while Jaynul *et al.* [8] had found a slight female predominance.

- The circumstances of discovery were dominated by respiratory and renal manifestations, with a frequency of 80% each, followed by digestive manifestations (50%).

This result shows that renal signs are not always in the foreground during the course of GNEC. Extra-renal signs may dominate GNEC symptomatology [9]. Nagaraju *et al.* [10] reported skin and joint involvement in 17.2% of cases. Faye *et al.* [11] reported pulmonary signs in 62.5% of cases, joint signs in 30% and ENT signs in 10%. These data concur with those found in our series, where we found a predominance of pulmonary manifestations with a frequency of 80%.

- Associated comorbidities were dominated by hypertension and diabetes mellitus

in 60% and 40% respectively.

- Biologically, two (2) or 20% of patients had creatinine levels below 500 µmol/l on admission, while 8 or 80% had creatinine levels above 500 µmol/l on admission. We noted that all our patients had a fall in creatinine levels of less than 500 µmol/l after treatment.
- The mean creatinine level was 726 µmol/l on admission, compared with 251 µmol/l after treatment, for a total reduction of more than 50% in 8 out of 10 patients.

It was lower than in the series by Quigora *et al.* [6] and Ozgur *et al.* [12], who found a mean value of 362.85 µmol/l and 328.33 µmol/l.

Mean proteinuria at admission was 4165.15 versus 1352.24 after treatment. This reduction in creatinine and proteinuria justifies the efficacy of the treatment received by our patients.

- The etiology of extra-capillary glomerulonephritis was dominated by anti MPO/PR3 ANCA vasculitis in 50% of cases, anti MBG ANCA vasculitis in 30% of cases, followed by IgA nephropathy and Cryoglobulinemia in 10% each.
- In this study, we did not find a correlation between histological lesions and a fall in creatinine levels.
- According to therapeutic data, all our patients benefited from immunosuppression and corticosteroid boluses.

Five patients benefited from hemodialysis versus five non-hemodialysed patients.

We found a statistically significant correlation between extra-renal purification (hemodialysis) and the fall in creatinine levels.

We did not find a correlation between etiology and the fall in creatinine levels.

- Sociodemographic parameters were not correlated with the fall in creatinine levels.

We found complete remission of renal function characterized by a fall in creatinine levels below 97 umol/l, and negativation of proteinuria and hematuria.

We did not find a statically significant correlation between complete remission of renal function and sociodemographic parameters, biological data, comorbidities, anatomopathological data and therapeutic data.

## 5. Conclusions

GNEC is a serious condition, not uncommon in our setting.

The most characteristic and frequent mode of onset was rapidly progressive renal failure.

We noted a fall in creatinine levels to over 50% in 8 cases (80%) and one case of complete remission.

The etiology of GNEC was dominated by anti MPO/PR3 ANCA vasculitis in 50% of cases.

We found a statistically significant correlation between extra-renal purification and a fall in creatinine levels.

The vital prognosis of this pathology remains unfavorable without treatment.

Early detection and appropriate management by qualified medical staff could considerably reduce the morbidity and mortality associated with this disease.

## Acknowledgments

We would like to express our sincere thanks to all the professors, speakers, and individuals who, through their words, advice, writings, and critiques, guided our thinking and agreed to meet with us and answer our questions during our research.

## What is Known about the Subject

MT is the most common renal complication in multiple myeloma and is associated with a poor prognosis.

## What is New in Our Study

Our results seem to show the beneficial effect of the HCO protocol, with 56% of patients able to be weaned off dialysis vs. no patients in the untreated group.

## Contribution of the Authors

All authors participated in data collection, analysis, and manuscript writing. The final manuscript was read and accepted by all authors.

## Conflicts of Interest

The authors declare no conflicts of interest.

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