Open Access Library Journal
2021, Volume 8, e7902
ISSN Online: 2333-9721
ISSN Print: 2333-9705

Electrophoresis of Proteins in the Biochemistry Laboratory of the University Hospital of Brazzaville

Fylla Koumou Onanga[1,2,3], Jeanne Kibah Gambomi[3], Monde Ikia[3], Rod Ibara-Okabande[3], Barnes Yoyo[3], C. R. Dobhat-Doukakini[1], Reine F. Eboka-Loumingou Sakou[1,4], Childerick Lekana[1], Aliocha Natuhoyila Nkodila[4,5*], Etienne Mokondjimobé[1,5], Benjamin Longo Mbenza[5,6]

[1]Faculty of Health Sciences, Marien Ngouabi University, Brazzaville, Congo
[2]Center National of Reference for Sickle Cell Disease, Brazzaville, Congo
[3]Biochemistry Laboratory, University Hospital Center, Brazzaville, Congo
[4]National Public Health Laboratory, Brazzaville, Congo
[5]Lomo University of Research, Kinshasa, DRC
[6]Department of Medicine, University of Kinshasa, Kinshasa, DRC
Email: *nkodilaaliocha@gmail.com

How to cite this paper: Onanga, F.K., Gambomi, J.K., Ikia, M., Ibara-Okabande, R., Yoyo, B., Dobhat-Doukakini, C.R., Eboka-Loumingou Sakou, R.F., Lekana, C., Nkodila, A.N., Mokondjimobé, E. and Mbenza, B.L. (2021) Electrophoresis of Proteins in the Biochemistry Laboratory of the University Hospital of Brazzaville. *Open Access Library Journal*, **8**: e7902.
https://doi.org/10.4236/oalib.1107902

Received: August 29, 2021
Accepted: September 15, 2021
Published: September 18, 2021

Abstract

Background and aim: The electrophoresis of serum proteins is one of the examinations requested at the Biochemistry laboratory, with a view to highlight various pathologies. The aim of our study is to analyze the different electrophoretic profiles encountered in our current practice. **Methods:** This is a retrospective study of 350 serum samples collected at the biochemistry laboratory of the University Hospital Center (CHU) of Brazzaville. The electrophoresis of serum proteins was carried out on a Minicap Flex Piercing machine from Sebia. **Results:** One hundred and ninety-five (195) sera from women and 155 sera from men were collected from patients aged 12 to 85 years. Ninety-one, or 26% of PSE were normal. Two hundred and fifty nine or 74% were pathological. Inflammation was noted in 194 (55%) of cases of which 145 (41%) were chronic and 49 (14%) acute. Forty-two (12%) of our patients had beta-gamma block and 11 (3%) others presented with nephrotic syndrome. Monoclonal peaks were observed in 12 patients (3%). **Conclusion:** This study highlights the plurality of different electrophoretic profiles, with a predominance of profiles emanating from the Gastro-Enterology department. It nevertheless reveals the question of relevance in the request for these examinations, since no clinical information is documented for the attention of the clinical practitioner.

Subject Areas

Biochemistry

Keywords

Electrophoresis, Serum Proteins, Minicap, Protein Profiles

1. Introduction

Serum protein electrophoresis remains a widely used analytical method in clinical biology [1] [2]. This examination currently makes it possible to link the electrophoretic profile to a certain number of pathologies, including immune, inflammatory and hepatic diseases, nephrotic syndrome and cancers [3] [4] [5]. It thus helps to refine the diagnosis, treatment and therapeutic monitoring of patients [6] [7] [8] [9]. In Congo Brazzaville, the electrophoretic profile of patients passing through our laboratories is not known. Hence this study proposes an analysis of the different electrophoretic profiles encountered during the analysis of sera. The aim of the study was to show the electrophoretic profile of patients who had been received at the Biochemistry laboratory at the Brazzaville Hospital and University Center.

2. Methods

This is a retrospective study of 350 patients aged 12 to 85 received at the Biochemistry laboratory of the Brazzaville University Hospital from January to December 2015. The electrophoresis of serum proteins was carried out on fasting samples, taken on dry tubes after centrifugation at 3000 revolutions for 5 minutes. Hemolyzed, opalescent and lactescent samples were excluded. These samples were stored at +4˚C and then analyzed within 2 days of receipt in the laboratory, without exceeding one week. The capillary electrophoresis technique on a Minicap Flex piercing automaton made it possible to define the different profiles and the total protein assay was carried out by the Biuret method on a Cobas C111 automaton from Roche.

3. Results

Analysis of the 350 identified cases revealed that 275 came from the different departments of the CHU, whose distribution was 155 sera from women and 195 sera from men (**Figure 1**).

The ages of our patients ranged from 12 to 85 years (**Figure 2**). The age group over 55 was more represented with a frequency of 50%.

The most demanding departments were the gastroenterology department (33%), rheumatology (31%), hematology (22%) and the pediatric department (14%) (**Figure 3**).

Relevant clinical information was missing in over 80% of requests. When indicated, the reasons for prescribing in descending order were liver disease, long-term fever, rheumatoid arthritis and 24 hour proteinuria elevation (**Table 1**).

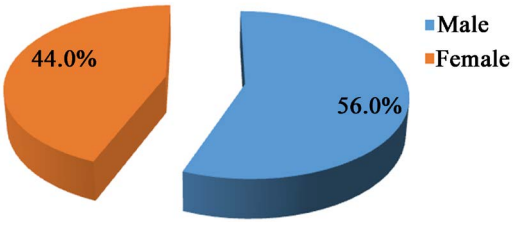

Figure 1. Distribution of the study population by sex.

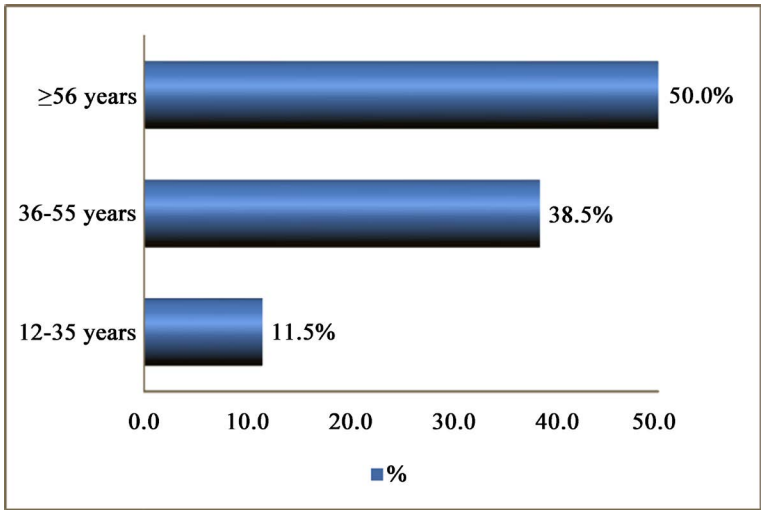

Figure 2. Distribution of the study population by age.

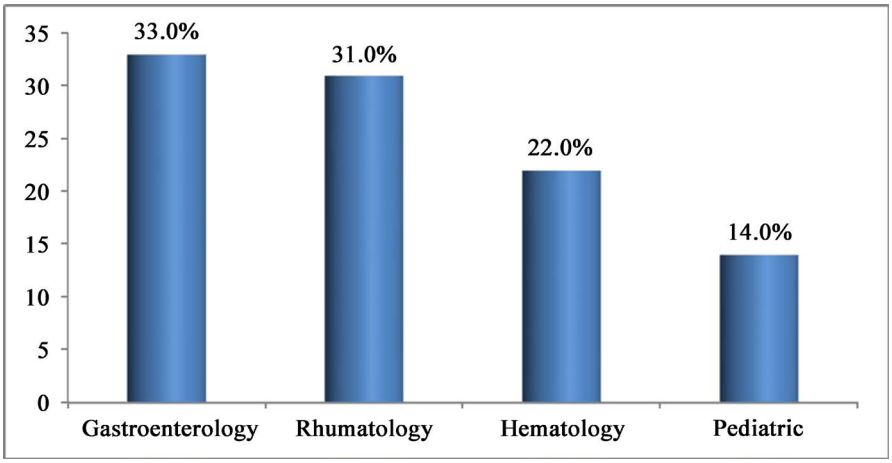

Figure 3. Distribution of the study population according to the requesting services.

Table 1. Distribution of the study population according to the reasons for prescriptions.

Reasons for prescriptions	Effective	%
Lack of clinical information	280	80.0
Hepatopathy	41	11.7
Fever during log	14	4.0
Rheumatoid arthritis	11	3.1
High 24 hour proteinuria	4	1.1

In Table 2, we noted that 26% of the exam performed was normal and 74% had returned pathological. Inflammation was noted in 194 (55%) of cases of which 145 (41%) were chronic and 49 (14%) acute. Forty two (12%) of our patients had beta-gamma block. Eleven (3%) patients presented with a picture of nephrotic syndrome accompanied by severe hypoalbuminemia. We observed monoclonal peaks in 12 patients (3%) located in the gamma globulin zone, indicating dysglobulinemia (Table 2).

4. Discussion

Capillary electrophoresis allowed us to observe the morphology of the different fractions, and to make a consistent interpretation. It is a very sensitive method which allows a very fine definition of the different peaks but which nevertheless requires a critical interpretation. Capillary electrophoresis allows a complete automation of the analysis associated with a fast and resolving free solution separation into six protein fractions major (albumin, α1-, α2-, β1-, β2-, and γ-globulins) [1]. This analytical tool makes it possible to detect the major syndromes confronting clinicians throughout their practice in a hospital environment [2] [3].

Since their application in clinical biology, electrophoresis techniques have shown all their interest in the detection of monoclonal dysglobulinemia at low cost [8] and have benefited from significant developments [6].

In our study, 12 monoclonal peaks were found, all of which (100%) migrated to the gamma globulin zone. A study by Sunita Tripathy *et al.* carried out on a series of 150 patients suspected of having multiple myeloma revealed 87.5% of the monoclonal bands detected in the gammaglobulin area and only 12.5% of the peaks are detected in the beta area [4] [10] [11] [12] [13]. On the other hand, the study by Ouardia Bouayadi *et al.* carried out on 410 patients, 72.5% of monoclonal bands are detected in the gammaglobulin zone and barely 27.5% in the beta zone [5] [14] [15] [16] [17]. Faced with the presence of these monoclonal-looking bands, an indication of immunotyping was essential to characterize the peaks, which was undoubtedly the limitation of this study.

5. Conclusion

Electrophoresis of serum proteins is a frequently prescribed biomedical practice

Table 2. Distribution of the study population according to profile type.

Profile type	n = 350	%
Normal	91	26.0
Inflammation	196	56.0
Nephrotic syndrome	10	3.0
Beta-gamma block	43	12.0
monoclonal peak	10	3.0

for the demonstration of qualitative and/or quantitative abnormalities of serum proteins. Its main and indisputable indication is the low-cost screening for monoclonal dysglobulinemia. The interpretation of this examination turns out to be easy, especially if good medical prescription practices are followed and if the medical biologist takes into account certain interpretation difficulties.

State of current knowledge on the subject is:

- Routine examination in the medical biochemistry laboratory;
- Diagnosis of monoclonal gammopathies;

Contribution of our study to knowledge is:

- Interest of the clinician-biologist collaboration for a correct interpretation;
- Know how to have EPS interpretation recommendations.

Contributions from the Authors

Principal editors: Fylla Onanga Koumou, Etienne Mokondjimobé.

Critical readers: Benjamin Longo Mbenza, Etienne Mokondjimobé.

Biological analyzes: Aliocha Nkodila, Monde Ikia, Barnes Yoyo, Rod Ibara, Jeanne Gambomi Kiba.

CR Dobhat-Doukakini, Reine F. Eboka-Loumingou Sakou, Childerick Lekana.

Supervision: Benjamin Longo Mbenza, Etienne Mokondjimobé.

Conflicts of Interest

The authors declare no conflicts of interest.

References

[1] Albert, A., Gaume, M., Ughetto, S., Sapin, V. and Fogli, A. (2010) Évaluation du couplage protéinémie + électrophorèse des protéines sériques totales par technique capillaire (Capillarys 2, Sebia): Expérience clermontoise. *Annales de Biologie Clinique*, **68**, 657-667.

[2] Szymanowicz, A., Cartier, B., Couaillac, J.P., Gibaud, C., Poulin, G., Rivière, H., *et al.* (2006) Proposition de commentaires interprétatifs prêts à l'emploi pour l'électrophorèse des protéines sériques. *Annales de Biologie Clinique*, **64**, 367-803.

[3] Le Carrer, D. (1995) Profils électrophorétiques ou profile protéiques? Intérêts respectives et limites d'utilisations. *Revue Française des Laboratoires*, **1995**, 79-85. https://doi.org/10.1016/S0338-9898(95)80258-4

[4] Tripathy, S. (2012) The Role of Serum Protein Electrophoresis in the Detection of Multiple Myeloma: An Experience of a Corporate Hospital. *Journal of Clinical and Diagnostic Research*, **6**, 1458-1461.

[5] Ouardia, B., Mohammed, B., Nawal, R., Said, A. and Mohammed, C. (2019) Electrophorèse des protéines sériques: Etude de 410 profils électrophorétiques. *The Pan African Medical Journal*, **32**, 161. https://doi.org/10.11604/pamj.2019.32.161.11455

[6] Karfo, R., Kabré, E., Safir, N., Bouabdellah, M., Benchekroun, L., Sakandé, J., *et al.* (2018) Interprétation délicate de l'immunofixation des protéines sériques. *The Pan African Medical Journal*, **30**, 130. https://doi.org/10.11604/pamj.2018.30.130.13662

[7] Le Carrer, D. and Bach-Ngohou, K. (2004) L'électrophorèse capillaire automatisée

en biologie clinique. Colloque du Syndicat national des biologistes des hopitaux (SNBH) 2004.

[8] Oualla, J. (2018) Profil d'électrophorèse des protéines sériques chez une population des hémodialysés chroniques. Thèse N˚ 256.

[9] Bissan, T., Diawara, A., Karfo, A., Teguete, A., Tangara, O., Guindo, A., *et al.* (2020) Une électrophorèse des protéines sériques insolites dans un contexte de cholangiocarcinome. *The Pan African Medical Journal*, **35**, 117. https://doi.org/10.11604/pamj.2020.35.117.20616

[10] Vavricka, S.R., Burri, E., Beglinger, C. and Degen, L. (2009) Électrophorèse des protéines sériques: Un test sous-utilisé mais très utile. *Digestion*, **79**, 203-210. https://doi.org/10.1159/000212077

[11] Vijayashree, N. (2009) Le schéma d'électrophorèse des protéines sériques chez les patients atteints de maladies chroniques dans un hôpital de soins tertiaires. *Indian Journal of Clinical Biochemistry*, **24**, 204.

[12] Nayak, B.S., Mungrue, K., Gopee, D., Friday, M., Garcia, S., Hirschfeld, E., *et al.* (2011) L'épidémiologie du myélome multiple et le rôle de la détection de la bande M sur l'électrophorèse sérique dans un petit pays en développement. Une étude rétrospective. *Archives of Physiology and Biochemistry*, **117**, 236-240. https://doi.org/10.3109/13813455.2011.582875

[13] Kyle, R.A. and Rajkumar, S.V. (2009) Les critères pour le diagnostic, la stadification, la stratification du risque et l'évaluation de la réponse du myélome multiple. *Leucémie*, **23**, 3-9.

[14] Katzmann, J., Kyle, R.A. and Lust, J. (2013) Immunoglobulines et reconnaissance en laboratoire des protéines monoclonales. In: Wiernik, P.H., Goldman, J.M., Dutcher, J.P., *et al.*, Eds., *Maladies néoplasiques du sang*, 5, Springer, New York, 565-588.

[15] Tschumper, R.C., Dispenzieri, A. and Abraham, R.S. (2013) L'analyse moléculaire des gènes d'immunoglobulines révèle une parenté clonale fréquente dans les gammapathies monoclonales doubles. *Journal du cancer du sang*, **3**, e112.

[16] Guastafierro, S., Ferrara, M.G. and Sica, A. (2012) Doubles composants monoclonaux sériques et hémopathies malignes: seulement une association fortuite ? Examen de 34 cas. *Leukemia Research*, **36**, 1274-1277. https://doi.org/10.1016/j.leukres.2012.05.008

[17] Garcia-Garcia, P., Enciso-Alvarez, K. and Diaz-Espada, F. (2015) Gammopathies biclonales: Etude rétrospective de 47 patients. *Revista Clínica Española*, **215**, 18-24. https://doi.org/10.1016/j.rce.2014.07.003