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Comparison between immunofixation and electrophoresis for the early detection of relapsed multiple myeloma

Comparação entre imunofixação e eletroforese na detecção precoce de recidivas do mieloma múltiplo

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ABSTRACT

Introduction: Multiple myeloma (MM) is an incurable progressive hematological neoplasia characterized by heterogeneous evolution and by relapses after therapy. **Objective:** Compare the effectiveness of serum immunofixation (SIF) and electrophoresis (SPE) techniques in the detection of relapses in MM patients undergoing treatment at the University Hospital of Santa Maria (HUSM). **Material and methods:** The study was conducted from January 2012 to July 2014 and included 52 patients from HUSM with confirmed diagnosis of MM. The retrospective monitoring based on laboratory analyses indicated that nine of these patients relapsed, in whom it was possible to compare the effectiveness of SIF and SPE techniques for detecting relapses. **Results:** For the nine patients, SIF always detected MM relapses earlier than SPE, with a precocity ranging from 2.0 to 18.8 months, for an average of 6.6 months. **Discussion and conclusion:** The results indicated that SIF was more effective than SPE for the early detection of relapses, regardless of the class and type of M component (mono/biclonal). Therefore, the use of SIF allows for better monitoring of MM patients, especially for the detection of relapses, thereby helping in choosing the most appropriate therapy and resulting in increased duration of survival period free of disease.

Key words: multiple myeloma; monoclonal immunoglobulins; immunofixation; electrophoresis; relapses.

INTRODUCTION

The multiple myeloma (MM) is a progressive B-cell hematological malignancy, characterized by the unregulated and clonal proliferation of plasma cells of the bone marrow (BM), which produce and secrete anomalous monoclonal immunoglobulin or fragments of these (free light chain or Bence-Jones protein), called M-protein, myeloma protein or paraprotein, which are secreted into the blood and/or urine[1-4]. In hematological neoplasm, MM is the disease with worse prognosis and lower survival rates, 5 years in 15%-20% of cases[5-7].

International centers of cancer registry have reported an increase in incidence rates and mortality caused by MM in recent decades, although it is not yet clear whether this is due to the new means of diagnosis or an actual increase in new cases of the disease[5]. Although there is not yet a exact and official knowledge of the incidence MM in Brazil, since the disease is not recorded in the annual estimates of the Bazilian National Cancer Institute[8], some studies, such as Hungria *et al*. (2008)[9], Paula and Silva (2009)[10], and Keren (2010)[11], indicate that the average age at diagnosis is 60.5 years, with most cases diagnosed when the disease is already at an advanced stage.

The diagnosis of MM depends on identification of monoclonal plasmocytes in the BM, M-protein in the serum or urine and evidence of bone lesions[12]. The use of efficient and accurate techniques for MM diagnosis is essential to differentiate it from other monoclonal gammopathy, which facilitates therapeutic decision, besides providing adequate indicators on the effectiveness of therapy[13-16]. Currently, serum protein electrophoresis (SPEP) remains the standard technique for the diagnosis and treatment of patients with MM[17]. Although SPE agarose gel can be considered a

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relatively simple laboratory method for the detection of M-protein, the immunofixation serum (SIF) technique is considered the gold standard for confirming the presence of these proteins and to distinguish light and heavy chains in MM[18, 19]. The combination of SPE and SIF techniques increases up to 97% sensitivity in the detection of M-protein in patients with MM[12, 20].

Whereas, following treatment there may occur complete remission of MM, but not its cure[21, 22], it is important monitoring these patients in order to be able to detect relapse as early as possible[23]. In this context, a comparison between SIF and SPE techniques on its effectiveness in early detection of MM relapses, through the retrospective analysis of serum samples from nine patients, was the main objective of this study.

MATERIAL AND METHODS

Patients

The study population consisted of patients diagnosed with MM monitored at the Outpatient service of Hematology of the University Hospital of Santa Maria (HUSM), RS, Brazil, between January 2012 and July 2014. The evolution of 52 patients followed up during the study is shown at **Figure 1**. All patients had undergone routine laboratory tests before each visit and received the treatment standardized by HUSM.

For inclusion in the study were considered patients with a confirmed diagnosis of MM. Patients were excluded if: a) lost their clinical follow up and/or has incomplete data from the medical records; b) attended with disease relapsed and advanced state; and c) attended at the place where the research was conducted (HUSM) to chemotherapy and after performed clinical laboratory monitoring in the city of origin.

As the study of the patients was done retrospectively, the results of serum analysis (SPE and laboratory measures) were interpreted at each clinic visit, spreadsheets were developed for each study patient for better monitoring, especially for those who were in complete remission of the disease and could relapse.

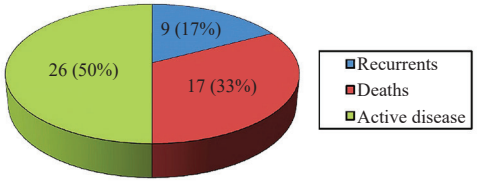

FIGURE 1 – *Patients with MM (n = 52) included in the study. Progress during the period from January 2012 to July 2014: death, response to treatment with relapse and active disease with no appropriate therapeutic response*

MM: multiple myeloma.

Laboratory analysis

Samples (pre-analysis)

Blood samples were collected at the Hematologic-Oncology Laboratory of HUSM. To collect blood, the venipuncture standard technique was used and the material was transferred to Vacutainer® tubes, BD Diagnostics, USA. Tubes without anticoagulant were used for serological tests, while tubes with 7.2 mg of anticoagulant dipotassium of ethylenediaminetetraacetic acid (EDTA) served for CBC analysis. After centrifuging the samples at 4,000 evolutions per minute (rpm) for 10 minutes, the patients' serum was stored in aliquots (Eppendorf tubes) in a freezer at -70ºC.

SPE and SIF

SPE technique was performed in electrophoretic tub/CELM, containing 80 ml of CELM buffer – pH 9.5. Serum was applied to agarose film (CELM Gel), according to the technique recommended by the manufacturer. The protein fractions reading were performed by a Software Program for Scanning Densitometry.

SIF analyzes were performed in Sebia® HYDRASYS® instrument with HydraGel IF Sebia 2/4, according to the manufacturer's instructions. Such analyzes were performed at the Biochemistry Laboratory of the Hospital de Clínicas de Porto Alegre (RS), Brazil. Serum proteins were separated in an alkaline buffer (pH 9.1) for 9 minutes at 20 W (42 VH). The types of antisera to specific classes of immunoglobulins (immunoglobulins class G, A and M [IgG], [IgA] and [IgM], respectively) and light chains (κ and λ) were applied, and the identification was performed after antigens-antibodies complex staining, which resulted in immunoprecipitation. All reagents are included in the IF/Sebia kit.

Gels reading were performed according to the presence or absence of monoclonal and/or biclonal band(s) of immunoglobulin chains (IgG, IgA and IgM) linked to its light-chain κ and λ or only free light chain (κ and/or λ). Two patterns are considered, one normal (absence of monoclonal component), and the other abnormal (presence of monoclonal or biclonal component).

Serological measures

Serologic measures were performed in the Biochemistry Department of the Clinical Analysis Laboratory of HUSM, using

Siemens Dimension Pand Plus analyzers. Immunoturbidimetic method was used for immunoglobulin (IgG, IgA e IgM) analysis. For creatinine and albumin dosages, we used the colorimetric method; for lactate dehydrogenase (LDH) analysis, we used the ultraviolet (UV) method.

Blood counts were performed at Hematology Department of HUSM, using Sysmex XE 2100 equipment, while for serum β_2-microglobulin measuring samples were sent to Laboratório de Análises Clínicas Álvaro (PR) for analysis by chemiluminescence method.

Statistical analysis

Because it is a case study, we only calculated the mean values and standard deviation for some of the variables under study, using the SPSS 15.0 software.

RESULTS AND DISCUSSION

The analysis of medical records of 52 patients with confirmed diagnosis of MM indicated that their average age was 59 years, ranging 28-83 years. The predominant race was white (56%), followed by the brown (23%) and black (21%), and the predominant sex was male (55.8%) (**Table 1**). The earlier onset of disease in this study, in relation to the 70-80 years age group, found around 1973[24], can be mainly attributed to advances in analysis techniques, allowing to diagnose it earlier. Regarding race, our results differ from those reported by Kyle *et al*. (2002)[25] and by Klaus *et al*. (2009)[26], in which there was a higher incidence of the disease among black people. The MM relationship with population's race is difficult to clearly establish for Brazilian conditions, since the ethnicity of the population varies among the different regions of the country[27]. The results obtained from the 52 patients who participated in the present study (Table 1) indicate predominance of IgG immunoglobulin (48%), followed by IgA (29%), free light chain (FLC) (23%) and IgM (2%). The presence of imunoglubulin class D (IgD) and class E (IgE) and nonsecretory MM were not detected. These results confirm those of other studies that the most common myeloma was IgG, with rare cases of IgD, IgE and nonsecretory myeloma[28, 29].

TABLE 1 – Features and general information about 52 patients with MM evaluated in the present study

Features	General information
Sex	29 (55.8%) male and 23 (44.2%) female
Race	29 (56%) white, 11 (21%) black and 12 (23%) brown
Age	Average 59 years ± 13.5 years, 15 (28.8%) 28-48 years, 23 (44.2%) 49-69 years, and 14 (26.9%) above 70 years
Monoclonal component	24 (48%) IgG, 15 (29%) IgA, 12 (23%) FLC, and 1 (2%) IgM
Risk factors	17 (33%) exposure to toxic agents[a], 10 (19%) genetic[b], 9 (17%) smoker/alcoholic[c], and 16 (31%) had no risk factor

MM: multiple myeloma; IgG: immunoglobulin G class; IgA: immunoglobulin A class; FLC: free light chains; IgM: immunoglobulin M class; a: radiation and toxic agents of occupations involving pesticides, paint, pottery, and welding; b: first-degree relatives with hematological and/or autoimmune disorders; c: long-term of alcohol and/or tobacco use.

Several studies have reported the existence of risk factors that help the emergence of MM, especially exposure to high doses of ionizing radiation, occupational exposure to agricultural and petrochemical industries in the presence of benzene and other organic, and exposure to insecticides and herbicides[26, 29]. Also lifestyle factors, such as socioeconomic status, smoking and alcohol, may predispose MM occurrence[30]. In the population that constituted the present study, the most prevalent factors, in decreasing order, were: exposure to toxic agents, genetic alterations, smoking and alcohol consumption (Table 1).

In most cases, relapses in patients with MM develop aggressively[21], therefore the importance of its early detection through effective methods. SIF method is considered the gold standard[31, 32], with high sensitivity and specificity to detect the resurgence of a monoclonal protein and to distinguish the heavy chains from the light chains present in the serum and urine of patients with MM. From the 52 patients who were monitored in this study, nine relapsed during the study period, enabling to observe the evolution of the disease before and after relapse. The comparison between SIF and SPE techniques regarding their effectiveness in detecting relapses of patients in remission is shown in **Figures 2**, **3** and **4**, in which the subjects were grouped according to immunoglobulin classes. One aspect to be highlighted refers to the fact that there was a predominance of IgA standard in the nine patients who relapsed, showing the aggressiveness and high relapse risk in this MM subtype.

Figure 2, shows the results of five relapsed patients (1, 2, 3, 4 and 7) with the same type of monoclonal/biclonal heavy chain (IgA), it is observed that in the first serum analysis of all patients, SPE was not sensitive in detecting the monoclonal component, although the patients had clinical symptoms suggestive of relapse, for example, increased intensity of bone pain, asthenia and generally feeling unwell. When SPE results were negative in the same samples of these patients, SIF was applied, and the presence of monoclonal component was detected, confirming the suspicion of MM relapsed.

The higher sensitivity of SIF in relation to SPE in detecting MM relapse observed in patients with IgA standards also occurred in the two patients (5 and 9) type IgG protein (Figure 3), and in the two patients (6 and 8) that showed type FLC (Figure 4).

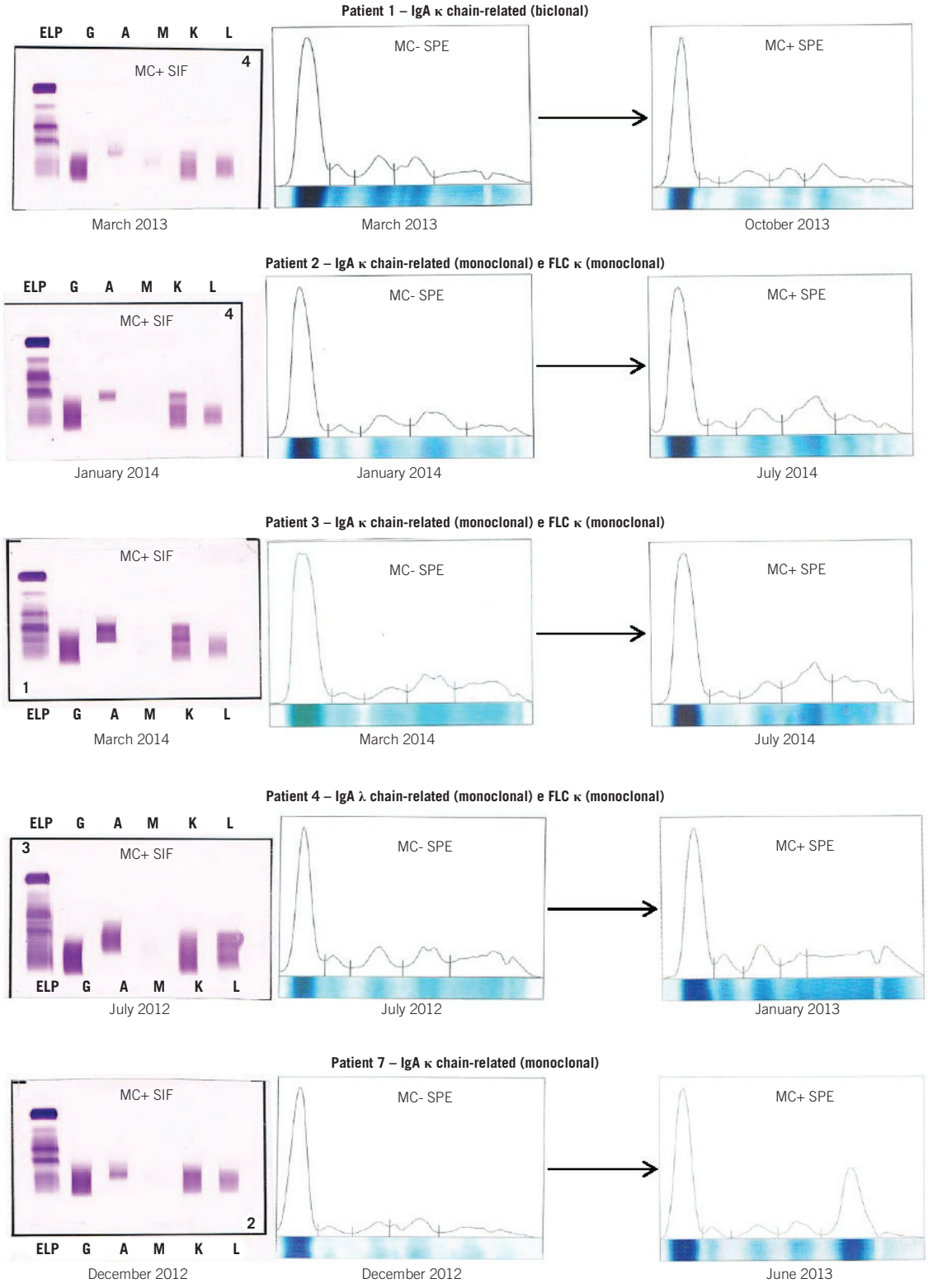

FIGURE 2 – *Comparative images between SIF and SPE in serum proteins analysis to detect mono/biclonal components in patients 1, 2, 3, 4, and 7, with the same IgA component, at different moments*

MC+ and MC- indicate the presence and absence of mono/biclonal components, respectively.

SIF: serum immunofixation; SPE: serum electrophoresis; IgA: immunoglobulin A class; MC: monoclonal component; FLC: free light chains.

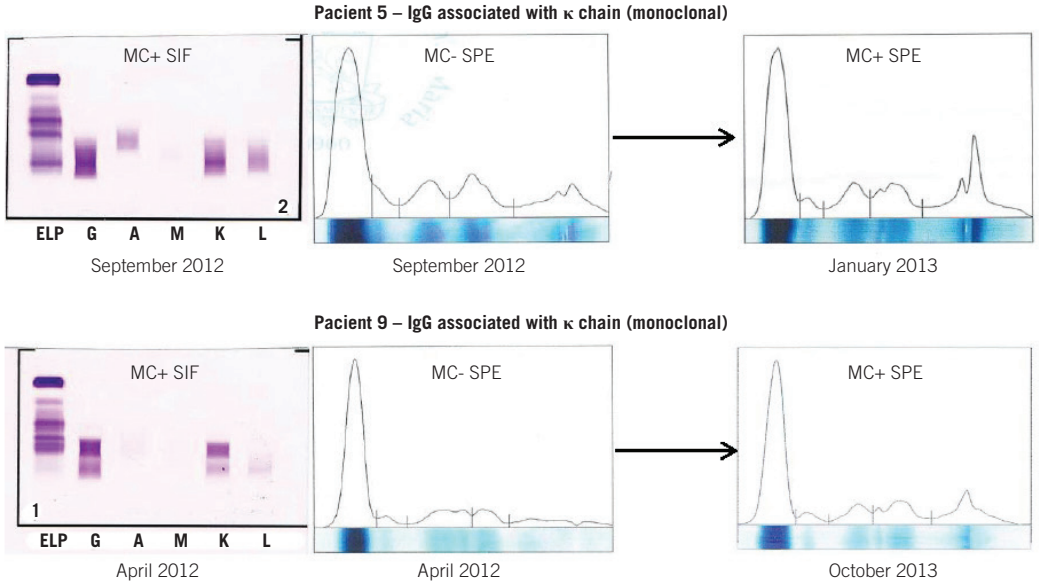

FIGURE 3 – *Comparative images between SIF and SPE in serum proteins analysis to detect MC in patients 5 and 9, with the same IgG component, at different moments*

MC+ e MC- indicate the presence and absence of mono/biclonal components, respectively.

SIF: serum immunofixation; SPE: serum electrophoresis; MC: monoclonal component; IgG: immunoglobulin G class.

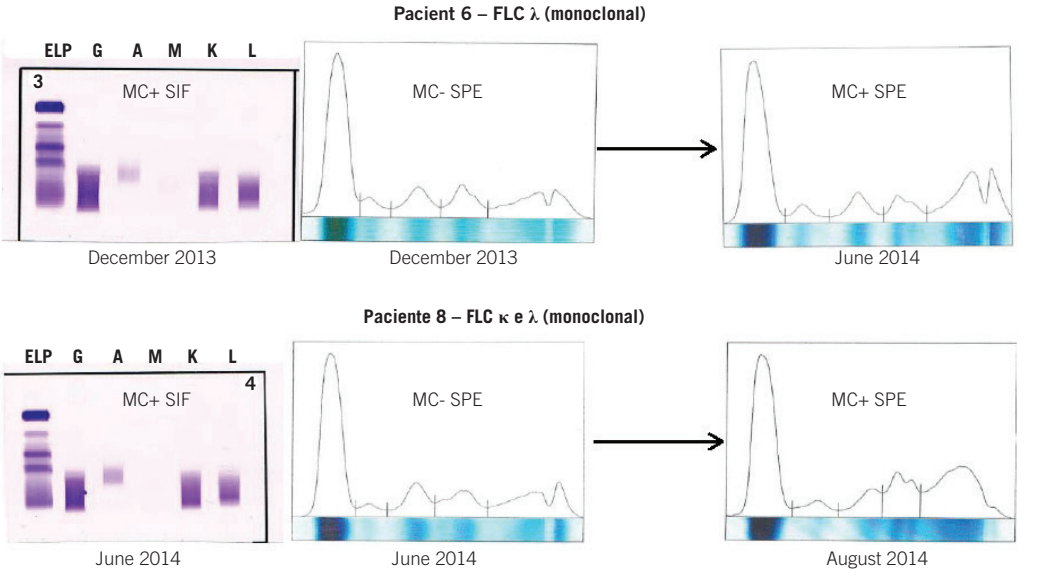

FIGURE 4 – *Comparative images between SIF and SPE in serum proteins analysis to detect MC in patients 6 and 8, with the same FLC component, at different moments*

MC+ and MC- indicate the presence and absence of mono/biclonal components, respectively.

SIF: serum immunofixation; SPE: serum electrophoresis; MC: monoclonal component; FLC: free light chains.

Table 2 was developed from the results presented in Figures 2, 3 and 4. It shows the date of relapse detection by SIF and SPE serum analysis, which allows quantitative comparison of the two techniques as its sensitivity in the early detection of relapses. In the nine relapsed patients, the early average of monoclonal pattern detection by SIF exceeded SPE in 6.6 ± 4.8 months, varying only 2.0 months in the worst case (pacient 8) and 18.6 months in the most favorable situation (pacient 9).

This greater sensitivity of SIF in relation to SPE in detecting monoclonal immunoglobulin, found in this study, confirms the results of several studies conducted mainly in the1980s and 1990s[33-38]. Working with a group of 101 patients with monoclonal gammopathy, Potdevin *et al*. (1983)[36] found that they were correctly identified by SIF in 97 pacients, compared with only 50 cases when SPE was employed. For Vrethem *et al*. (1993)[38], the low sensitivity SPE is due to the inability of that technique to detect low concentrations of monoclonal immunoglobulins (< 1 g/l^{-1}) when they are hidden or next to other protein bands. Working particularly with IgM monoclonal immunoglobulin, Keren (1990)[34] identified its presence by SIF in a concentration as high as 20 g/l^{-1}, without that the IgM in question was detected by SPE. For the author, the negativity occurred by SPE is due to the fact that IgM molecules have large volumes and, therefore, they diffuse slowly in the agarose gel used in SPE. One thing to highlight in these works is that they have not been conducted with the specific objective of comparing the two techniques on the ability for early detection of relapses in patients with MM, as it was done in this study.

By comparing SIF and SPE techniques in a MM patient that underwent chemotherapy, Reichert *et al*. (1982)[37] found that it was wrongly considered free from gammopathy by SPE technique, since, when analyzing the same samples retrospectively using SIF, as it was done for the nine patients of this study (Figures 2, 3 and 4), the authors reported they found positive results for IgAλ monoclonal gammopathy. Marshall (1980)[35] also compared SPE and SIF techniques for identification of IgG, IGA and IgM monoclonal immunoglobulins in three serum samples with high concentrations and in three samples with low concentrations of such immunoglobulin, and found that SIF was able to identify immunoglobulins in all samples, while SPE shown ambiguous results in the three samples with lower concentration and also in one samples with high concentration. This was attributed to the greater capacity of SIF in determining the reaction of antibodies with monoclonal immunoglobulin.

This set of findings from the literature, added to the present study, proves that SPE, when used alone, is not a suitable technique for the early detection of MM relapses, and should always be performed in conjunction with other techniques more sensitive, such as SIF and FLC measurements, among others. Thus, patients can be monitored with greater safety, in both active and remission phase, and the relapses may be detected early and treatment may be quickly introduced.

Besides the determination of monoclonal immunoglobulin and their light chains and FLC -related (Figures 2, 3 and 4), we also analyzed the serum proteins β_2-microglobulin and albumin, which are important in monitoring MM relapses. According to Casaretto (2005)[39], measurement of β_2-microglobulin is a significant prognostic factors because it reflects the tumor mass and renal function of each patient affected by the disease. Based on the determination of $\beta_2$microglobulin and albumin measurements, Greipp *et al*. (2005)[40] proposed an international classification for MM staging, in which patients are divided into I, II and III, whose median survival corresponds to 62, 44 and 29 months, respectively.

By analyzing these two serum proteins, it was possible to compare the staging inthe nine patients studied at the moment MM relapse was detected by SIF and SPE (**Table 3**). It was observed that two of the nine patients (pacients 2 and 7) were in the early stages of relapse when the monoclonal protein was detected by SIF technique (stage I) and were already at stage II when SPE detection occurred. Similar behavior was observed in patients 4 and 6, in which the relapse could have been detected earlier (stage II) by SIF than by SPE (stage III). This detection of relapses in less advanced stages of MM, using SIF, illustrates the advantage of this technique in relation to SPE in monitoring patients with the disease, since it enables to anticipate the indication of treatment schemes and/or autologous stem cells transplantation. Therefore, this anteciption in treatment could result in a more favorable outcome, since patients would be in better physical shape and health (lower bone pain intensity, regular humoral immunity and absence of anemia), increasing the chances of remission and, consequently,

TABLE 2 – Comparison between SIF and SPE techniques for sensitivity in the early detection of relapse in nine patients with MM

Patients (n = 9)	Relapse detection by SIF (date)	Relapse detection by SPE (date)	Anticipate the detection of relapse by SIF (months)
1	10/03/2013	22/10/2013	7.4
2	08/01/2014	09/07/2014	6
3	13/03/2014	02/07/2014	3.6
4	12/07/2012	02/01/2013	5.7
5	03/09/2012	10/01/2013	4.2
6	23/12/2013	30/06/2014	6.2
7	13/12/2012	14/06/2013	6
8	01/06/2014	31/07/2014	2
9	10/04/2012	27/10/2013	18.6

SIF: serum immunofixation; SPE: serum electrophoresis; MM: multiple myeloma.

TABLE 3 – ISS of recurrent patients at early positive SIF and SPE

Patients ($n = 9$)	Early positive SIF			Early positive SPE		
	β_2-m (mg/l)	Serum albumin (g/dl)	ISS	β_2-m (mg/l)	Serum albumin (g/dl)	ISS
1	2.4	3.6	I	2.3	4.5	I
2	3.2	3.7	I	4.2	3.7	II
3	1.5	4.8	I	1.5	4	I
4	4.1	3.2	II	6.9	3.3	III
5	1.9	3.7	I	2.1	3.6	I
6	4.3	3.6	II	8.3	3.6	III
7	2	4.1	I	3.3	3.2	II
8	2	4	I	1.7	4	I
9	2.2	3.6	I	2.2	4.1	I

Reference value: β_2-m (0.6-2.1 mg/l); serum albumin (3.4-5.0 g/dl); staging according to ISS; stage I (β_2-m < 3.5 mg/l; serum albumin ≥ 3.5 g/dl); stage II: neither stages I nor III. There are two categories for this stage: 1) β_2-m < 3.5 mg/l, but serum albumin < 3.5 g/dl or 2) β_2-m from 3.5 to < 5.5 mg/l, regardless serum albumin level; stage III: β_2-m ≥ 5.5 mg/l.

ISS: International Staging System; SIF: serum immunofixation; SPE: serum electrophoresis; β_2-m: serum β_2-microglobulin.

increase of survival and improvement in quality of life of patients.

One of the analytical limitations of this study is that it does not offer the possibility of comparing SIF with SPE in detecting monoclonal immunoglobulins (heavy chains and/or FLC) in urine samples from the nine patients studied. This was due to the difficulty of collecting 24-hour urine sample in relapsed patients, since they were already weakened and living elsewhere. To overcome this deficity, it would be important to perform serum free and heavy chains measurements in order to obtain the corelation between them. Through these analyzes, it would be possible to increase the sensitivity to detect the remission state of these patients, as well as their relapses.

Some laboratory parameters that assist in monitoring the nine patients in study were evaluated and are shown in **Table 4**, in which it is observed that there was worsening of anemia in the patients studied. In 66.6 % pacients (1, 2, 4, 6, 7 and 8), this had already occurred even when the relapse was detected early by SIF. This result can be explained by the fact that such patients have MM for several years (average of six years) and, therefore, are already debilitated by the disease itself as well by the frequent use of therapies and/or chemotherapies in previous relapses.

Although the quantification of complete monoclonal immunoglobulins (IgG, IgA and IgM) assist in monitoring patients with MM, it must be used in conjunction with high sensitivity methods[32]. As seen in Table 4, patients 1, 2, 3, 4 and 7 showed average normal values of IgA 345.8 mg/dl (128.9-775.0 mg/dl) when the relapse was detected early by SIF, and average values 3.6 times increased (787.3-2,240.0 mg/dl) when the relapse was detected late by SPE. In both relapsed patients with monoclonal component IgG (5 and 9), although this immunoglobulin values are at normal levels, we observed that there was an average increase of 989.6 mg/dl in SIF to 1497.5 (51.3 %) in SPE, which reinforces tha advantage of using SIF in relation to SPE in the early detection of this monoclonal component in relapsed MM.

Serum creatinine reflects renal function and, therefore, patients 2 and 6 already had higher value (2.0 and 1.4 mg/dl, respectively), even when the relapse was detected by SIF. This occurred because these patients had MM type FLC at diagnosis, which caused damage to renal tubules. As relapse was detected later by SPE, the amount of creatinine level increased from 2.0 to 2.6 mg/dl in patient 2, and 1.4 to 2.1 in patient 6, indicating worsening of renal function.

TABLE 4 – Laboratories parameters at early positivity by serum immunofixation (SIF) and at early positivity by serum electrophoresis (SPE) of relapsed patients

Patients ($n = 9$)	Laboratories values at early positivity by SIF						Laboratories values at early positivity by SPE					
	CBC	IgG (mg/dl)	IgA (mg/dl)	IgM (mg/dl)	LDH (UI/I)	CRE (mg/dl)	CBC	IgG (mg/dl)	IgA (mg/dl)	IgM (mg/dl)	LDH (UI/I)	CRE (mg/dl)
1	NC/NC	612.5	128.9	140.5	218	0.6	ANN	691.4	1538.9	58.5	218	0.9
2	NC/NC	785.8	158.2	17	122	2	ANN	637.3	787.3	15.8	151	2.6
3	N	1242	508.6	62	-	1	N	1183.3	804.2	49.8	-	1.1
4	NC/NC	1591	775	70.4	89	1	ANN	1982.4	867.7	54	102	1.6
5	N	1030.6	156.8	55.6	231	0.8	N	1440.2	103.9	63.3	176	0.9
6	NC/NC	1549	119.5	35.8	230	1.4	ANN	1964	160	27.2	254	2.1
7	NC/NC	717.7	158.5	18.1	167	0.7	ANN	582.7	2240	11.1	98	0.7
8	NC/NC	1530	153.3	41.8	160	0.7	ANN	1605.4	190.5	44.8	155	0.9
9	N	948.6	33.8	16.6	254	0.6	ANN	1554.9	76.8	29.7	200	0.7

Reference values: IgG (681-1.648 mg/dl); IgA (87-474 mg/dl); IgM (48-312 mg/dl); LDH (81-234 UI/I); CRE (Male: 0.8-1.3; Female: 0.6-1.0 mg/dl).
SIF: serum immunofixation; SPE: serum electrophoresis; CBC: cells blood count; N: normal; NC/NC: normocytic normochromic anemia; IgG: immunoglobulin G class; IgA: immunoglobulin A class; IgM: immunoglobulin M class; LDH: lactate debydrogenase; CRE: creatinine.

Besides providing early detection of MM relapses in relation to SPE, SIF also allows us to evaluate in general the evolution of clonality, in both intact immunoglobulins and FLC. In **Table 5**, it is observed that with the exception of patients 5, 7 and 9, there was a change in the type of monoclonal component during the course of the disease. It is likely that this heterogeneity clonal also noted by Magrangeas *et al*. (2013)[41], Ahn *et al*. (2014)[42] and Brioli *et al*. (2014)[43], is due to the prolonged use of chemotherapy drugs and maintenance after the relapses occurred. This change of MM clonality implies intrinsic cellular resistance to subsequent therapies, requiring new therapeutic approaches.

TABLE 5 – Behavior of monoclonal immunoglobulins at the initial diagnosis of MM and after detection of relapse by SIF

Patients (n = 9)	Time to progression in MM (years)	Nº of relapses	Type of MC at the initial diagnosis	Type of MC in the last relapse
1	12	3	IgA/κ (monoclonal)	IgA/κ (biclonal)
2	10	2	FLC κ and λ (monoclonal)	IgA/κ (monoclonal) and FLC κ (monoclonal)
3	5	1	IgA/κ (monoclonal)	IgA/κ (monoclonal) and FLC κ (monoclonal)
4	4	1	IgA/λ (monoclonal)	IgA/λ (monoclonal) and FLC λ (monoclonal)
5	2	2	IgG/κ (monoclonal)	IgG/κ (monoclonal)
6	2	1	IgG/λ (monoclonal)	FLC λ (monoclonal)
7	8	2	IgA/κ (monoclonal)	IgA/κ (monoclonal)
8	4	1	IgG/κ (monoclonal)	FLC κ e λ (monoclonal)
9	3	1	IgG/κ (monoclonal)	IgG/κ (monoclonal)

MM: multiple myeloma; SIF: serum immunofixation; MC: monoclonal component; FLC: free light chains; IgA/κ: immunoglobulin A class κ light chain-related; IgA/λ immunoglobulin A class λ light chain-related; IgG/κ: immunoglobulin G class κ light chain-related; IgG/λ: immunoglobulin G class λ light chain-related.

CONCLUSION

The comparison between SIF and SPE techniques performed in this study, via retrospective analysis of MM relapsed patients, showed that SIF was more effective than SPE in the early detection of relapses, regardless of the class of monoclonal immunoglobulins present. The average of the nine relapsed patients, SIF has detected a monoclonal standard 6.6 months earlier than SPE, varying only two months in the worst cases to 18.6 months in a more favorable situation.

RESUMO

Introdução: *O mieloma múltiplo (MM) é uma neoplasia hematológica progressiva e incurável, caracterizada pela evolução heterogênea e pela ocorrência de recidivas nos pacientes após o tratamento.* ***Objetivo:*** *Comparar as técnicas de imunofixação (IFS) e eletroforese (EFS) séricas quanto à eficácia em detectar precocemente as recidivas em pacientes com MM e em tratamento junto ao Hospital Universitário de Santa Maria (HUSM).* ***Material e métodos:*** *O estudo foi realizado no período de janeiro de 2012 a julho de 2014, sendo incluídos 52 pacientes do HUSM com diagnóstico confirmado de MM. O monitoramento retrospectivo, realizado por meio de análises laboratoriais, indicou que nove desses pacientes recidivaram, nos quais foi possível comparar a eficácia das técnicas de IFS e EFS na detecção de tais recidivas.* ***Resultados:*** *Nos nove pacientes em estudo, a IFS sempre detectou as recidivas do MM antes da EFS, sendo que essa precocidade variou de dois a 18,8 meses, com tempo médio de 6,6 meses.* ***Discussão e conclusão:*** *Os resultados indicaram que a IFS foi mais eficaz do que a EFS em detectar as recidivas, independentemente da classe e do tipo de componente M (mono/biclonal). Portanto, o uso da IFS permite monitorar melhor os pacientes com MM, principalmente na detecção das recidivas, o que pode auxiliar na escolha da terapia mais adequada, além de aumentar o tempo de sobrevida livre da doença.*

Unitermos: *mieloma múltiplo; imunoglobulinas monoclonais; imunofixação; eletroforese; recidivas.*

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