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Beneficial effect of plasma exchange in unrecovered cases of acute Guillian Barré Syndrome

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ABSTRACT

Objectives: *The present study was designed to determine whether plasma exchange has a beneficial effect on the course and outcome of unrecovered severe cases of acute Guillian-Barré Syndrome (GBS) if started two months or more after onset of the disease. The predictors of poor outcome in those patients were also analyzed.*

Methods: *Twenty patients with onset of acute Guillian Barré Syndrome of tow months or more were selected in the study. All patients fulfilled the criteria required for diagnosis of acute Guillian Barré syndrome, either clinical, laboratory or neurophysiological criteria. All patients of the study were subjected to three to five sessions of plasma exchange throughout 2-4 weeks. Serial clinical and neurophysiological assessments were done for each patient.*

Results: *The following predictors of poor outcome were detected in our study: Older age of patients at onset of the disease, severe rapidly progressive paralysis within 4 days of the onset, presence of preceding prodroma of gastrointestinal or upper respiratory tract infections, presence of papilloedema, increased CSF protein > 1 gm/dl, impairment of neurophysiological parameters (Severely reduced compound motor action potential, severely reduced motor nerve conduction velocity, severely prolonged distal motor latency).*

- *Outcome after plasma pharesis:*

* *No improvement in three patients (15%).*

* *Seventeen patients (85%) developed improvement as follows:*

Ten patients (50%) get complete improvement, three patients (15%) get mild improvement, and four patients (20%) get moderate improvement. The clinical improvement was parallel with improvement in the neurophysiological parameters.

Conclusion: *In those patients with unrecovered sever cases of acute Guillian Barré Syndrome in whom plasma exchange had never been used before, even after long period of onset of the disease, plasma exchange must be tried where good results were reported in our study. There are several predictors of poor outcome in-patients with acute Guillian Barré Syndrome must be put in mind for prognostic and therapeutic concepts.*

INTRODUCTION

Guillian-Barré Syndrome (GBS) is an acute immunemediated disease of the peripheral nervous system that annually affects at least 1.7/100.000 population[1]. Since the marked decline in the incidence of poliomyelitis all over the world, GBS has become the major cause of rapid flaccid paralysis in healthy persons. Although most patients with GBS recover spontaneously, 7 to 22% are left with some disability, 10 to 35% of patients may require mechanical ventilation, 5 to 10% may have permanent disabling weakness, 3 to 10% relapse and 2 to 5% die[2,3,4]. The likelihood of permanent disability increases with severity and duration of the disease and many patients may require prolonged stays in the hospital[5]. Furthermore prediction of the clinical course and prognostic factors of the disease may help to improve information and to consider other therapeutic implications. Until now severely reduced muscle action potential amplitude on myography[6,7], older age[6-8], need for ventilation[6,8-9] and a severe rapidly progressive course of the disease[6,8,9,10,11] have been associated with poor outcome. To avoid a repetition of what happened with steroid treatment, which was used in the treatment of GBS for many years before controlled studies demonstrated lack of beneficial effect[12,13], prompt objective assessment of plasma exchange is needed all over the course of GBS.

The present study was initiated for several aims.

1. To confirm previous factors related to poor outcome and to assess new prognostic factors.
2. To confirm the lack of beneficial effect of corticosteroid.
3. To assess the beneficial effect of plasmapheresis in unrecovered severe forms of GBS two months or more after onset of the disease.

Nearly most of the previous studies stressed and confirmed the beneficial effect of plasma exchange early on the course of acute GBS, but where still there is a respectable percent of patients are left with disable weakness or require prolonged stays in the hospital, there is a need to study the effect of plasma exchange in those patients two months or more after onset of the disease in whom plasma exchange had not been done before aiming to reduce their mortality, length of hospital stay, maximum functional deficit and risk of residual disability.

PATIENTS AND METHODS

The study had been done in the Neuropsychiatry Department, Sohag Faculty of Medicine, South Valley University throughout 3 years period. 20 patients were included in the study that fulfilled the diagnostic criteria for acute GBS, which agreed upon by the ad hoc NINCDS Committee[14] table (1).

Inclusion criteria

1. Patients with onset of the disease of more than two months who fulfilled the diagnostic criteria for acute GBS.
2. A scale of 5 grades was used to express severity of weakness, 0= normal power, 1= mild weakness, 2= moderate weakness, 3= sever weakness, 4= no active movements, 5= requires assisted ventilation. Only patients with scores of or more than three were included in the study.
3. Steroids were used in all patients of the study early in the course of GBS with no response.

Exclusion criteria

[1] Severity less than grade three, [2] duration of illness less than 8 weeks, [3] age less than 12 years or more than 60 years, [4] previous therapy with immunosuppressive drugs other than steroids, [5] Previous IV immunoglobulins therapy, [6] previous plasma exchange, [7] past history of similar attacks of GBS, [8] chronic progressive forms of GBS [chronic inflammatory demyelinating polyneuropathy], [9] other concurrent neuromuscular diseases, [10] other concurrent medical diseases that can cause polyneuropathy e.g. diabetes.

All patients of the study were subjected to the following :

1. Demographic data.
2. History of antecedent infections before onset of weakness [e.g. gastrointestinal or respiratory tract infections].
3. Time from onset of weakness until the patients became severely disabled.
4. Complete neurological examination before and after plasma pharesis as follows:
   - The first clinical assessment was done at the day of entry to detect:
     * Severity of muscle weakness in both upper & lower limb muscles. A scale of five grades was used to express muscular weakness as described in inclusion criteria.
     * Cranial nerves affection.
     * Sensory function abnormalities either subjective or objective.
     * State of respiratory functions (normal, distressed or ventilated).
   - Patients were followed up clinically two times weekly during the 1st, 2nd, 4th, and 6th weeks of the study to assess the previous items assessed at the time of entry (degree of muscle weakness, cranial nerves affection, state of respiration and sensory abnormalities).
5. Laboratory investigations: before onset of plasma exchange aiming at exclusion of other concurrent medical diseases e.g. DM, hepatic, renal, collagen diseases, etc.
6. Cerebrospinal fluid (CSF) examination: CSF was obtained at the day of or after entry and was subjected to complete chemical and cytological investigations mainly to detect CSF content of protein and cells.
7. Neurophysiological studies: including needle electromyography, sensory and motor conduction velocities, and distal latencies. The neurophysiological studies were performed using standardized conventional techniques at the entry, 1st, 2nd, 4th, and 6th weeks after the entry. Both median and ulnar nerves in the upper limbs and the common peroneal nerve in the lower limbs were studied, compound motor action potential [CMAP] of the abductor pollicis brevis, the abductor digiti minimi and the extensor digitorum brevis muscles were analyzed. The variables of conduction velocities, amplitude of CMAP, and distal latencies were assessed extensively for diagnostic and prognostic significance.
   N.B.: The findings of lab. Investigations and neurophysiological studies in all patients of the study were in accordance with diagnosis of GBS
8. Plasmapheresis: plasma exchange was carried out by means of an intermittent flow COBE spectraTMapheresis system. 40-50 cc/Kg body weight of patient's plasma was exchanged for every session of the plasma pharesis. Three to five sessions (every session takes about 2-3 hours) of plasma exchange throughout 2-4 weeks, with total of 200-250 cc/Kg body weight of patient's plasma was exchanged. 5% salt free albumen was used as replacement solution, except for one patient who received fresh frozen plasma instead. Each patient was assessed clinically and neurophysiologically after each session and/or every week to detect degree of improvement in muscle strength. Change in CMAP by more or equal to 1 mv, change in the MNCV> or equal to 10 m/sec., or change in the DML by > or equal to 0.5 msec. were considered signs of improvement. The number of sessions and the time taken to achieve better score clinically and neurophysiologically were detected.

Table 1. Diagnostic criteria of GBS.

Features required for diagnosis
Progressive motor weakness of more than one limb
A reflexia or marked hyporeflexia
CSF cell counts of no more than 50 monocytes or 2 polymorphonuclear leukocytes.
Features strongly supportive of the diagnosis
Progression over days to a few weeks
Relative symmetry
Mild sensory signs or symptoms
Cranial nerve involvement
Onset of recovery 2-4 weeks after halt of progression
Autonomic dysfunction
Initial absence of fever
Elevated CSF protein after 1 week of symptoms
Abnormal electrodiagnostics with slowed conduction or prolonged F waves
Features required to rule out other diagnoses
No history of hexacarbon abuse
No evidence of porphyria
No history or culture evidence of diphtheria
No history or evidence of lead intoxication
Symptoms not purely sensory
No evidence for polio, botulism, toxic neuropathy, organophosphates, or tick paralysis.

RESULTS

Table 2. Demographic and clinical data of patients at entry:

Factor		No	(%)
Age	12- < 30 Ys	8	40%
	13- < 60 Ys	12	60%
Sex	Males	7	35%
	Females	13	65%
Prodroma	GIT Prodroma	12	60%
	URTI	8	40%
Time from onset to entery	>8→12 weeks	11	55%
	12→ 18 weeks	9	45%
Onset of severe weakness	< 4 days	15	75%
	> 4 - 8 days	5	25%
Functional score at entry	≤ 3	20	100%
Cranial nerve deficit		8	40%
Papilloedema		13	65%
CSF protein	> 0.06 g\l	7	35%
	> 1.2 g\l	13	65%

Table 3. Neurophysiological parameters of patients in relation to control

Parameters		Control (no=10)		Patients at entry (no=20)		
		Range	Mean±SD	Range	Mean±SD	P-value
MNCV	UL	50-72 m/s	63.2±2.3	17-28 m/s	23.1±4.1	P=0.0001
	LL	40-60 m/s	51.6±4.1	14-23 m/s	19.2±3.8	P=0.0001
DML	UL	2-4.5 ms	3.9±1.9	5.8-7.2 ms	6.1±2.9	P=0.02
	LL	4.2-5.2 ms	4.5±0.8	5.7-6.9 ms	5.9±1.1	P=0.031
CMAP	UL	2.8-6 mv	3.5±2.1	1.7-2.5 mv	1.8±0.4	P=0.02
	LL	2.5-6 mv	3.8±1.8	1.3-2.9 mv	1.9±0.9	P=0.01

Table 4. Neurophysiological parameters of patients during the study.

Parameters		Patient (no=20)				
		Entry	1st week	2nd week	4th week	≥ 6th week
		Range (mean ± SD)				
MNCV	UL	17-28 m/s 23.1±4.1	30-38 m/s 31.1±3.2 P=0.071	40-46 m/s 42.3±2.9 P=0.02*	44-50 m/s 46.2±3.1 P=0.01**	49-69 m/s 59.1±3.1 P=0.0001***
	LL	14-23 m/s 19.2±3.8	28-34 m/s 30.1±2.3 P=0.01**	38-43 m/s 39.1±2.3 P=0.001**	43-49 m/s 45.7±1.9 P=0.0001***	47-58 m/s 51.1±4.2 P=0.0001***
DML	UL	5.8-7.2 ms 6.1±2.9	5.1-5.9 ms 5.2±1.9 P=0.831	4.3-5.1 ms 4.8±1.9 P=0.31	3.8-4.4 ms 3.6±1.7 P=0.02*	2.5-4.1 ms 3.6±1.2 P=0.001**
	LL	5.7-6.9 ms 5.9±1.1	5.2-6.2 ms 2.6±0.4 P=791	4.7-5.7 ms 4.6±1.7 P=0.081	4.3-5.7 ms 4.3±0.9 P=0.04	4.5-5.1 ms 4.7±0.4 P=0.04
CMAP	UL	1.7-2.5 mv 1.8±0.4	2.1-2.9 mv 2.6±0.4 P=0.02*	2.8-3.1 mv 2.9±1.9 P=0.2*	3.1-4.9 mv 3.1±0.8 P=0.01**	3.2-4.2 mv 3.5±0.1 P=0.001**
	LL	1.3-2.9 mv 1.9±0.9	2.1-2.8 mv 2.2±0.8 P=0.08	2.3-2.9 mv 2.4±0.7 P=0.082	2.8-4.1 mv 3.1±0.7 P=0.001**	2.7-4.3 mv 3.3±1.1 P=0.001**

N.B. 1: The P Value is calculated in relation to the entry in every week of the disease.
2: * significant P value (P<0.05), ** mod. sig. (P< 0.00 1), *** highly sig. (P<0.0001)

DISCUSSION

Guillian Barré Syndrome (GBS) remains one of the most fascinating yet challenging conditions despite considerable advances in its understanding and treatment over the past 10 years[15].

Current epidemiological studies suggest an incidence of between 1 and 2/100000 with slightly more male individuals affected than female[16]. The incidence rises with age although there is a minor peak among young adults[17].

Several studies have been performed trying steroids on newly diagnosed GBS patients. Most of these studies favored that steroid are not helpful to speed recovery and in fact at least one study suggested that steroid actually may delay improvement[18].

On the other hand studies of steroids in chronic inflammatory demyelinating polyneuropathy (CIDP) have shown that they are beneficial. This is in sharp contrast to GBS where steroids have not been helpful and studies suggested that they might even aggravate the situation. So it is obvious that it helps to define, as clearly as one can, if a patient has CIDP or GBS[19]. CIDP-which sometimes is looked upon as a neurologic cousin of GBS- differs from GBS in some important aspects, including rate of onset of weakness, course and duration of the illness and the good response to treatment with corticosteroids. In CIDP, the weakness develops slowly and may take 6-12 month or longer to peak. Patients with CIDP may have a variety of courses like the chronic relapsing CIDP and the chronic progressive CIDP.

Fortunately most patients have either a clear-cut case of GBS with a rapid onset or the chronic relapsing or progressive forms of CIDP. Still a very small number of patient don't fit nearly into either of these categories and hence the use of other terms such as subacute CIDP and recurrent GBS to describe these patients[19]. Previously CIDP was sometimes called chronic GBS but that is probably a misnomer since as we discussed above, it is really different in many important aspects from GBS.

Results of a large multi-center study of the effect of plasma pharesis on patients with GBS published in 1985 indicated that on the average, those treated early in their illnesses within two weeks of onset fared even better than those treated later, they spent less time in the hospital and were able to walk sooner than untreated patients. The multi-center study research did not indicate what effects plasma pharesis might have if started after the 30th day of illness[20]. Both the French and the North American studies concluded that PE in GBS is most effective when carried out early in the course of the disease (within the first two weeks),and outcome might be improved if treatment is given when the patient does not have severe weakness or is started early in those with a rapid progression[20,21].

Several controlled trials have shown that both plasma exchange and intravenous immunoglobulin shorten the time of recovery when used in the early stages of neuropathy[20,21,22]. In the largest study of plasma exchange carried out in North America, this procedure improved the time to achieve walking unaided by 32 days, whereas plasma exchange clearly removed a blood born antibody mediating the neuropathy[22].

In our study the patients were followed up prospectively and closely monitored according to a predefined protocol where serial neurophysiological investigations and clinical assessments were performed beside the initial pretreatment one in a trial to define the different factors concerned with predicting poor outcome and to assess efficacy of plasma exchange including rate and onset of improvement in those unrecovered severe cases of acute GBS.

At first one of our main aims in this study was stressing on the strict criteria of diagnosis of acute GBS and exclusion of other causes of infective polyneuropathy mainly CIDP, the neurologic cousin of GBS. This aim was achieved through fulfilling the following:

* Selective criteria of acute GBS. Table (1).
  - All our patients were presented with acute onset of paralysis with peak reached within 7 days of onset while in CIDP the peak takes several months.
  - Corticosteroids were given early to all our patients of the study for at least 2 weeks with no signs of improvement. These results confirm the diagnosis of GBS and exclude CIDP.
  - The following independent predictors of poor outcome were reported:
    . Rapid onset of weakness < or equal to 4 days (75% of patients). Severity of

weakness with score more than or equals 3 (100% of patients).
- Older age of patients at onset of the disease (> 30 years in 60% of patients).
- Preceding prodroma mainly gastrointestinal or upper respiratory tract infections (60% and 40% respectively).
- Papilloedema (65% of patients)
- CSF protein >1 gram /dL in 65% of patients. (The increased CSF protein content in our patients can be explained by previous report which stated that CSF protein may be normal in the 1st week of the illness but may then rise to several grams/dl[23].

Extensive clinical observations supported by epidemiological studies suggested that about 75% of patients have a history of preceding symptoms of infection and serological studies reveal evidence of antecedent infection in about 30-50% of cases[24,25], these results are in agreement with our study which reported preceding symptoms of GIT infection in 60% and URT infection in 40% of patients. Our higher results are mostly due to selection of severe cases in our study. Our results are also in agreement with another study[26], which reported that age of onset more than or equal to 50 years, a preceding gastrointestinal illness and being bedbound or on the ventilator were associated with a significantly increased risk of being unable to walk independently 8 weeks or 6 months after the start of therapy, also rapid onset of weakness (< or = 4 days) before the start of treatment resulted in a poor outcome.

In our study our patients were presented with abnormally reduced conduction velocities and CMAP, these abnormalities were correlated with prognosis where all our patients were presented with sever acute GBS with persistent disability. Our results agree with previous reports[27,28] which stated that the extent of abnormalities in conduction velocities and CMAP appear to correlate with prognosis. Early in the course of the disease, many patients retained normal conduction studies until the disease became well established, where in our study all our patients were presented with well established severe GBS therefore all of them were associated with abnormal conduction study.

The French GBS study group recently determined the effect of plasma exchange in wildly affected patients with GBS[29]. This study showed that two sessions of PE result in earlier recovery compared with no treatment. Moreover, patients with moderate and severe forms of the disease benefited from 2 additional exchange. Improvement of the amplitude of the by >1 mV between the 1st EMG and 2nd one indicated improved outcome[26].

These previous results are in parallel with our results which reported onset of recovery of the severe forms of GBS after at least three sessions of PE in four of ten patients who get complete improvement, and the other six patients get complete improvement after five sessions. The other improved patients (3- patients get mild improvement & 4- patients get moderate improvement) benefited after five sessions not more. The clinical improvement in-patients of our study was in parallel with the improvement in the neurophysiological parameters as reported previously.

It seems that the proportion of patients with extensive axonal damage following the acute phase of the disease is not altered by plasma exchange. Unfortunately, these figures of persistent deficit have not been significantly altered by the advent of plasma exchange and intravenous immunoglobulins, which mainly reduce the time taken to recover and not the percentage of patients making a good recovery[28].

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الملخص العربى

تأثير غسيل البلازما فى الحالات الحادة والغير متحسنة لمتلازمة جيلان باري

الهدف من البحث: دراسة مدى فائدة غسيل البلازما فى الحالات الحادة الغير متحسنة لمتلازمة جيلان باري بعد أكثر من شهرين من بداية ظهور المرض. أيضا يلقى البحث الضوء على التوقعات السلبية للمرض فى هؤلاء المرضى.

وسائل البحث: تم اختيار عشرون مريضا خلال ثلاث سنوات ممن لديهم تاريخ مرضى لمتلازمة جيلان باري الحادة وقد تأكد تشخيص الحالات طبقا لخصائص المرض المعروفة وأيضا بعد عمل رسم الأعصاب وعمل تحليل السائل النخاعى الشوكى. تم عمل فحص إكلينيكى عصبى دقيق للمرضى فى بداية الدراسة ثم تم عمل جلسات غسيل بلازما للمرضى من ٣-٥ جلسات وتم عمل فحص أكلينيكى دورى ورسم أعصاب كل أسبوع أو بعد كل جلسة غسيل للبلازما.

النتائج: تم تحديد بعض التوقعات السلبية للمرض كالآتى:

حدوث المرض فى سن متقدمة.

تطور سريع وشديد لشلل العضلات خلال أربعة أيام من بداية المرض.

وجود عدوى بالجهاز التنفسى أو الجهاز الهضمى قبل المرض بأيام.

زيادة نسبة البروتين بالسائل النخاعى عن ١ جم/ديسيلتر.

ارتشاح العصب البصرى.

قصور شديد بالفحص الفسيولوجى العصبى مثل قصور شديد بسرعة توصيل الأعصاب الحركية وقصور بالجهد المستثار الحركى المركب.

أيضا بعد عمل جلسات غسيل البلازما تحسنت عشرة حالات بنسبة ٥٠٪ تحسن كامل وثلاث حالات تحسنت تحسن متوسط بنسبة ١٥٪ وأربع حالات تحسنت تحسن بسيط بنسبة ٢٠٪ ولم يتم التحسن فى ثلاث حالات بنسبة ١٥٪.

التحسن الإكلينيكى كان متوازيا للتحسن فى وظائف الفسيولوجيا العصبية للأعصاب.

من البحث نستخلص أنه: يجب تجربة غسيل البلازما فى الحالات الغير متحسنة لمتلازمة جيلان باري والتى لم يستخدم فيها الغسيل من قبل بعد مرور الفترة الحادة للمرض.