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Neuromuscular Respiratory Failure and Requirement of Mechanical Ventilation in Guillain-Barre Syndrome: Evaluation of Clinical Predictors

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ABSTRACT

Background: Respiratory failure necessitating institution of invasive mechanical ventilation remains one of the most serious complications among patients with diagnosed Guillain-Barre syndrome (GBS) being admitted to intensive care units. The present study was carried out to assess the clinical predictors which correlate well with requirement of mechanical ventilation in patient admitted to our respiratory intensive care unit with GBS.

Methods: Sixty patients records with diagnosed GBS admitted to our respiratory intensive care units were reviewed in this retrospective observational study. The following clinical and demographic variables were collected for study comparisons: Age, sex, co-morbid conditions, antecedent events, first symptoms at the onset of illness, pattern of motor involvement, time from onset of illness to bulbar involvement, time from onset of illness to confinement to bed, time to peak disability, upper limb power at peak disability, reflexes at peak disability, duration of mechanical ventilation and requirement of tracheostomy during course of the disease.

Results: A shorter duration between onset of illness to confinement to bed, presence of bulbar weakness, upper limb power<3/5 were predictive of requirement of mechanical ventilation. Prolonged ventilation and tracheostomy was required in 42.9% cases. The duration of ICU stay was 14 to 38 days in our study sample.

Conclusions: Patients with a shorter time gap between onset to confinement to bed, bulbar weakness and upper limb power <3/5(MRC grade) are more likely to require invasive mechanical ventilation during the ICU stay.

Keywords: Guillain-Barre syndrome, clinical predictors, mechanical ventilation

INTRODUCTION

Guillain-Barre syndrome (GBS) is a disorder of peripheral nerves which is mediated by autoimmunity. It is characterised by acute flaccid areflexic paralysis, cranial nerve innervated muscle weakness, varying degree of sensory and autonomic disturbances. Respiratory failure requiring mechanical ventilation remains one of the most serious complications and occurs in approximately 30% of cases.[1,2] Reduction in vital capacity and bulbar dysfunction indicates a major risk for respiratory failure in these patients.[3] The value of these parameters is limited as these have been used as criteria for starting mechanical ventilation and ventilation is considered indispensable with vital capacity (VC) <15 ml/kg or severe bulbar dysfunction.[4] These may reflect established respiratory failure rather than an increased risk of future respiratory failure. Respiratory management could be simplified if the guidelines for the use of elective ventilation and admission to the intensive

care unit (ICU) could be developed with accurate clinical predictors of respiratory failure identified early in the course of the disease.

The present study was carried out to assess the clinical predictors which correlate well with requirement of mechanical ventilation and tracheostomy in patient admitted to our respiratory intensive care unit with GBS.

Materials and Methods

Institutional Ethics Committee (IEC) approval was obtained before conducting the study.This retrospective observational study cohort constituted of patients diagnosed with GBS getting admitted into our Respiratory intensive care unit (RICU) at Sri Venkateswara Institute of Medical Sciences (SVIMS) university teaching hospital between August 2015 and June 2016. The diagnosis of GBS was made using the Asbury and Cornblath criteria.[5]

Sixty patients were divided into two groups based on the requirement of mechanical ventilation: Group V(Ventilated group) and Group NV(Non-ventilated group).Data before the institution of mechanical ventilation was collected in patients with GBS who required mechanical ventilation and from onset up to peak disability in those who did not receive mechanical ventilation. Clinical parameters of the two groups were then compared. Primary outcome was the requirement for mechanical ventilation. Secondary outcomes were duration of mechanical ventilation and requirement of tracheostomy during the course of the disease. The clinical and demographic variables that were collected for study comparisons were: Age, sex, co-morbid conditions, antecedent events , first symptoms at the onset of illness, pattern of motor involvement , time from onset of illness to bulbar involvement , time from onset of illness to confinement to bed, time to peak disability ,upper limb power at peak disability,reflexes at peak disability, duration of mechanical ventilation and requirement of tracheostomy during course of the disease.

Statistical analysis

Baseline and observed variables between the two groups was compared with student‘t’ test or propotion chisquare test for continuous and categorical variables respectively. $p<0.05$ was considered as statistically significant.

Results

Both groups were comparable with regard to age, sex ratio, comorbidities and antecedent illness. There was no significant difference with regard to onset of illness to bulbar weakness and time to peak disability. A shorter duration between onset of illness to confinement to bed was predictive of requirement of mechanical ventilation($p=0.029$). There was no significant difference with regard to first symptom at onset of illness or type of motor onset. Those who required mechanical ventilation presented with motor weakness as the first symptom rather than sensory symptoms. There was highly significant difference with regard to presence of bulbar weakness and requirement of mechanical ventilation ($p=0.000$). There was no significant difference with regard to seventh nerve involvement or upper limb deep tendon reflexes at peak disability. Whereas in patients with upper limb power<3/5 the requirement of mechanical ventilation was high which was statistically highly significant ($p=0.000$). Patients belonging to the ventilated group were on ventilator support on an average of 17 days. 42.9% of the ventilated group patients required prolonged ventilation and tracheostomy during the course of the disease. The longest and shortest duration of ventilation in our study cohort is 38 days and 1 day respectively. Among the patients who required tracheostomy the number of days on mechanical ventilator support was a minimum of 14 days and maximum of 38 days.

Discussion

Guillain-Barre syndrome (GBS) is an autoimmune disorder of peripheral nerves is characterised by acute flaccid areflexic paralysis, cranial nerve innervated muscle weakness, varying degree of sensory and autonomic disturbances. Acute mortality remains relatively high at 5%.[6-8]Respiratory failure requiring mechanical ventilation remains one of the most serious complications and occurs in approximately 30% of case s.[7,8]. Respiratory management could be simplified if the guidelines for the use of elective intubation and admission to the intensive care unit (ICU) could be developed with accurate clinical predictors of respiratory failure identified early in the course of the disease. The present study was carried out to assess the clinical predictors which correlate well with requirement of mechanical ventilation and

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tracheostomy in patient admitted to our respiratory intensive care unit with GBS.

In our study shorter duration between onset of illness to confinement to bed, presence of bulbar weakness and upper limb power<3/5 were predictive of requirement of mechanical ventilation whereas onset of illness to bulbar weakness, time to peak disability, first symptom at onset of illness, type of motor onset, seventh nerve involvement and upper limb deep tendon reflexes at peak disability couldnot predict the requirement of mechanical ventilation.

Uma Sundar et al (20005)[9] conducted a study to identify clinical and electro diagnostic predictors of neuromuscular respiratory paralysis in patients with GBS. Their study showed that 'early peak disability', autonomic dysfunction and bulbar weakness predicted the onset of respiratory paralysis whereas age, gender, neck or bifacial weakness, upper limb paralysis, or preceding infection did not influence the development of neuromuscular respiratory weakness. Similarly in our study bulbar weakness predicted the onset of respiratory paralysis. In our study also age, gender, bifacial weakness, upper limb paralysis, or preceding infection did not predict the development of neuromuscular respiratory weakness.

In a study done by Birinder S. Paul et al (2011)[10] revealed that simultaneous weakness of upper (UL) and lower (LL) limbs as the initial symptom, UL power less than Grade 3/5 at nadir, presence of neck and bulbar weakness, shorter duration from onset to bulbar weakness and confinement to bed and bilateral facial involvement were more frequently associated with the need for mechanical ventilation. Their study also revealed that factors independently associated with the need for mechanical ventilation included simultaneous motor weakness in UL and LL as the initial symptom, UL power<3/5 (Medical Research Council grade) and presence of bulbar weakness whereas preserved reflexes in the UL was independently associated with a lesser need for ventilation.

Sumaira Nabi et al (2014)[11] carried out a study to determine clinical predictors of respiratory failure in GBS patients. Their study concluded bulbar dysfunction and autonomic dysfunction as independent predictors of mechanical ventilation. Similar to their study bulbar dysfunction proved to be a predictor of mechanical ventilation in our study as well .Our study did not include autonomic dysfunction as independent predictor of mechanical ventilation.

Xiujuan Wu et al(2015)[12] in a study revealed that shorter interval from onset to admission, facial nerve palsy, glossopharyngeal and vagal nerve deficits and lower Medical Research Council (MRC) sum score at nadir were risk factors for mechanical ventilation.Their study also revealed that absence of antecedent infections and lower MRC sum score at nadir were predictors of poor short-term prognosis in mechanically ventilated patients regardless of treatment modality.

From a study done by Nemat Bilan et al (2015)[13] they concluded that younger age at disease onset, cranial nerve involvement and absent upper limb reflexes were predictors of respiratory failure in patients with GBS .Their study consisted exclusively pediatric population in contrast to our study which consisted predominatly adult population.

From a study done by Umarudu Toamad et al[14] ,they concluded that bulbar weakness and time to peak limb weakness≤5 days significantly predicted respiratory insufficiency as well as need for prolonged mechanical ventilation.Similar to their study in our study presence of bulbar weakness was predictive of requirement of mechanical ventilation.

From our study sample we conclude that patients with a shorter time gap between onset to confinement to bed, bulbar weakness and upper limb power <3/5(MRC grade) are more prone to need for mechanical ventilation during the ICU stay.

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Table I: Comparison of clinical features between the study groups

CLINAL FEATURES	Group V(n-21)	Group NV(n=39)	p-value
Onset of illness to bulbar weakness(days)	5.28(±4.07)	5.89(±4.59)	0.727
Onset of illness to confinement to bed(days)	2.52(±1.56)	4.41(±3.68)	**0.029**
Time to peak disability(days)	8.00(±7.52)	8.12(±5.52)	0.940

Data entered as mean (± Standard deviation), n=number of patients

Group V= Ventilated group, Group NV=Non ventilated group

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Table II: Comparison of bulbar weakness between the study groups

Bulbar weakness	Group V(n=21)		Group NV(n=39)		P value
	Cases	%	Cases	%	**0.000**
Present	18	85.7%	9	23.1%	
Absent	3	14.3%	30	76.9%	

Values entered as number of cases and percentage, n=number of patients,

Group V= Ventilated group, Group NV=Non ventilated group

Table III: Comparison of neurological signs between the study groups

	Group V(n=21)		Group NV(n=39)		P value
NEUROLOGICAL SIGNS	Cases	%	Cases	%	
Seventh nerve involvement					0.360
No involvement	6	28.6%	17	43.6%	
Unilateral involvement	0	0.0%	1	2.6%	
Bilateral involvement	15	71.4%	21	53.8%	
Deep tendon reflexes					
UL present	0	0.0%	5	12.8%	0.230
UL absent	21	100%	34	87.2%	
UL power					
<3/5	16	76.2%	10	25.6%	**0.000**

Values entered as number of cases and percentage, n=number of patients,UL=upper limb,

Group V= Ventilated group, Group NV=Non ventilated group

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