Disability Progression and Associated Costs in Incident Early-Onset Myasthenia Gravis Patients in France: A Longitudinal Cohort Study

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Background

- Myasthenia gravis (MG) is an autoimmune disorder of the neuromuscular junction and is caused by auto-antibodies directed at the muscle acetylcholine receptors.[1,2]
- MG is associated with a considerable burden of disease; patients are significantly impacted in both the short and long term, and many experience inadequate disease control, poor quality of life, and fixed muscle weakness.[3-6]
- In a previous longitudinal claim-based study in France, we reported that 34.6% of the 6,354 patients with incident MG were admitted to intensive care at least once, and 44.3% were treated with intravenous immunoglobulin during follow-up.[7]
- Understanding the progression of disability in MG is important in informing treatment strategies and improving patient care, but such data are scarce, particularly in patients with early-onset MG (onset at age <50 years).[8-11]

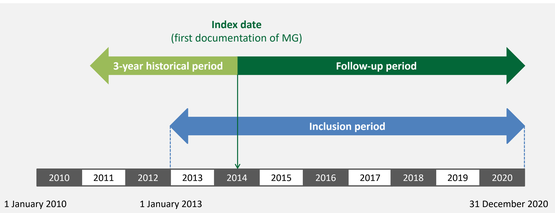
Objective

- To analyze the progression of disability and associated costs in patients with incident early-onset MG compared with the overall cohort with incident MG.

Methods

Study design and data source[7]

- This was a retrospective, longitudinal cohort study using the French national health insurance claims database (SNDS) from January 2013 to December 2020 (Figure 1).
- The index date was the date of the first healthcare reimbursement claim relating to MG documented during the study period.
- Patients were followed from the index date to the end of the study period (31 December 2020) or until death.
- A 3-year historical period dating from 1 January 2010 was also searched for previous MG-related claims.



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MG, myasthenia gravis.

FIGURE 1. Study design[7]

Patient population

- Patients aged ≥18 years were included in the full study population according to the eligibility criteria previously described.[7]
- Claims for delivery of an acetylcholinesterase inhibitor prescribed by a gastroenterologist were excluded.[7]
- Patients with <12 months of follow-up were excluded.
- Incident patients were defined as all patients with a first MG-related claim during the inclusion period and no history of any MG-related claim during the historical period between 1 January 2010 and the index date.[7]
- Early-onset MG was defined as onset of MG before the age of 50 years.[8-11]

Study outcomes

- Outcomes were assessed in the incident early-onset MG cohort and the overall incident MG cohort.
- Disability progression, as measured by disability status (eligibility for Disability Living Allowance), and use of sick leave were assessed.
- Costs (in Euros [€] at 2022 prices) associated with disability were evaluated over the follow-up period.

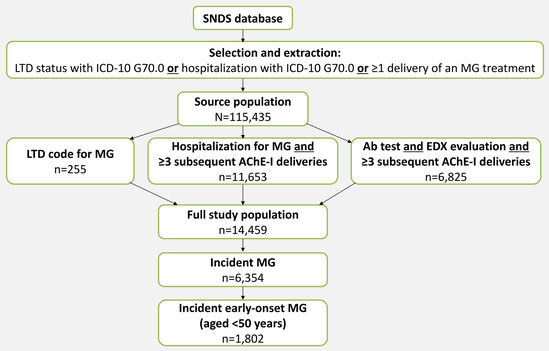
Statistical analysis

- Descriptive statistics were used to summarize the baseline characteristics and outcomes of the study populations.
- Predictors of disability progression were explored using a generalized estimating equation (GEE) model.

Results

Patient selection

- Among the 14,459 patients with MG included in the full study population, 6,354 patients had incident MG and 1,802 patients had incident early-onset MG (Figure 2).



Ab, antibody; **AChE-I**, acetylcholinesterase inhibitor; **EDX**, electrodiagnostic evaluation; **ICD-10**, International Classification of Diseases 10th Revision; **LTD**, long-term disease; **MG**, myasthenia gravis; **SNDS**, *Système National des Données de Santé* (French national health insurance claims database).

FIGURE 2. Patient flow

Baseline demographic and clinical characteristics

- Patients with incident early-onset MG were younger than those in the overall cohort with incident MG, and the proportion of female patients was higher (Table 1).
- Patients with incident early-onset MG had lower mean Charlson Comorbidity Index scores and had fewer comorbidities compared with the overall cohort with incident MG, including infections, asthma/chronic obstructive pulmonary disease, and cancer (Table 2).

TABLE 1. Baseline demographic characteristics

Characteristic	Incident early-onset MG (N=1,802)	Overall incident MG (N=6,354)
Age, years		
Mean (SD)	35.65 (8.94)	59.94 (18.34)
Median (IQR)	36 (28–44)	63 (47–74)
Distribution by age, n (%)		
18–40 years	1,149 (63.8)	1,149 (18.1)
41–65 years	653 (36.2)	2,310 (36.4)
>65 years	0 (0)	2,895 (45.6)
Sex, n (%)		
Male	611 (33.9)	4,424 (69.6)
Female	1,191 (66.1)	1,930 (30.4)
Follow-up		
Mean (SD), years	4.56 (2.19)	4.32 (2.23)

IQR, interquartile range; **MG**, myasthenia gravis; **SD**, standard deviation.

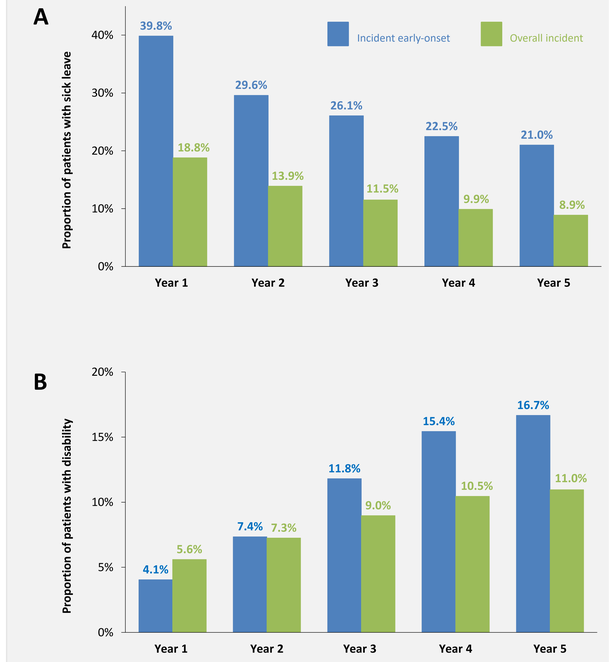
TABLE 2. Baseline clinical characteristics

Characteristic	Incident early-onset MG (N=1,802)	Overall incident MG (N=6,354)
Charlson Comorbidity Index[a]		
Mean (SD)	0.30 (0.55)	2.73 (1.95)
0, n (%)	1,326 (73.6)	3,612 (56.8)
1–2, n (%)	466 (25.9)	2,461 (38.7)
3–4, n (%)	10 (0.6)	255 (4.0)
≥5, n (%)	0 (0)	26 (0.4)
Comorbidities, n (%)		
Infection	159 (8.8)	857 (13.5)
Depression	147 (8.2)	663 (10.4)
Anxiety	105 (5.8)	681 (10.7)
Asthma/COPD	95 (5.3)	601 (9.5)
Hypertension	90 (5.0)	1,505 (23.7)
Cancer	75 (4.2)	688 (10.8)
Cardiovascular disease	35 (1.9)	811 (12.8)

[a]Charlson Comorbidity Index without age adjustment.
COPD, chronic obstructive pulmonary disease; **MG**, myasthenia gravis; **SD**, standard deviation.

Sick leave and disability

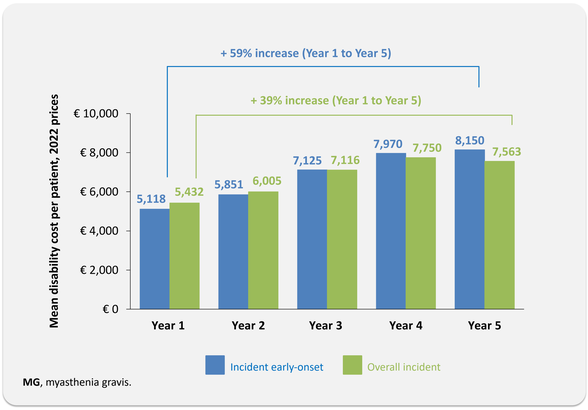
- Among patients with incident early-onset MG, 56.1% of patients took sick leave over the course of follow-up (39.8% occurring in the first year after diagnosis), and 16.5% transitioned to disability status (increasing from 4.1% in Year 1 to 16.7% in Year 5; data for overall follow-up not shown) (Figure 3).
- For the overall cohort with incident MG, 25.0% of patients took sick leave over the course of follow-up (18.8% in the first year), and 11.3% of the overall cohort transitioned to disability status (increasing from 5.6% in Year 1 to 11.0% in Year 5).



The number of patients in the incident early-onset cohort were: Year 1, n=1,802; Year 2, n=1,686; Year 3, n=1,516; Year 4, n=1,303; and Year 5, n=1,086. The number of patients in the overall incident cohort were: Year 1, n=6,354; Year 2, n=5,905; Year 3, n=5,184; Year 4, n=4,358; and Year 5, n=3,531. The numbers decline by year primarily because MG diagnosis could occur at any time from 2013 to 2019, and therefore patients had a variable length of follow-up during the study period.
MG, myasthenia gravis.

FIGURE 3. Evolution of (A) sick leave and (B) disability over time in incident early-onset MG vs overall incident MG

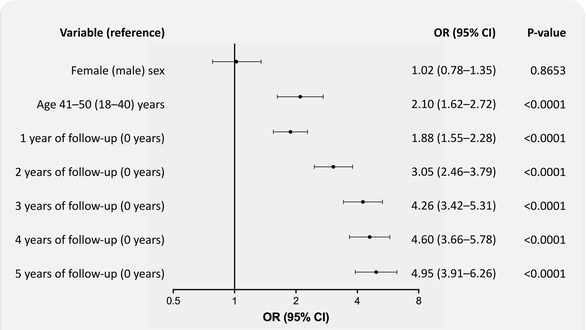
- Mean annual disability costs per patient in the incident early-onset cohort increased by 59% from Year 1 (€5,118) to Year 5 (€8,150; Figure 4).
- By contrast, mean annual disability costs per patient in the overall incident cohort increased by 39% from Year 1 (€5,432) to Year 5 (€7,563).



MG, myasthenia gravis.

FIGURE 4. Evolution of mean costs of disability in incident early-onset MG vs overall incident MG

- Older age and longer duration of follow-up were significant drivers of disability progression (Figure 5).



The x-axis is depicted on a log base 2 scale.
CI, confidence interval; **GEE**, generalized estimating equation; **OR**, odds ratio.

FIGURE 5. GEE model for disability progression

Conclusions

- **Disability progression in incident early-onset MG patients is substantial, with rising costs over time and a notable shift from sick leave to disability.**
- **Targeted, early interventions are essential to slow disability progression, optimize resource utilization, and improve long-term functional outcomes for this vulnerable patient group.**

Limitations

- Structured fields do not provide results specifying whether the electro-neuro-myogram result was normal or abnormal.
- The SNDS claims database does not provide medical information.

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