Open Access Original Research Article

MedPeer Publisher
Abbreviated Key Title: MedPeer
ISSN : 3066-2737
homepage: https://www.medpeerpublishers.com

Myasthenia Gravis in Meknès, Morocco: A 10-Year Retrospective Cohort Study.

DOI: 10.70780/medpeer.000QGQC

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ABSTRACT

Background: Myasthenia gravis (MG) is an antibody-mediated neuromuscular disorder with evolving epidemiology and increasingly effective therapies, yet data from North Africa remain scarce.
Methods: We retrospectively reviewed MG cases managed at the Neurology Department, Moulay Ismail Military Hospital (Meknès, Morocco) between March 2015 and March 2024. Demographic, clinical, electrophysiological, serological, imaging, treatment, and outcome data were extracted from standardized records.
Results: Thirty-three patients were included; 70% were female. Mean onset age was 34 years (1–55), and the median diagnostic delay 2 years 3 months. Ocular symptoms occurred in 87%, bulbar in 54%, limb-girdle in 39%, and respiratory in 18%; 42% were MGFA I. EMG showed a decrement in 48%. AChR antibodies were positive in 75%; anti-MuSK was negative in all eight tested. CT imaging was normal in 46%, showed thymoma in 36% and thymic hyperplasia in 18%. All received anticholinesterase therapy; 33% required corticosteroids, 15% additional immunosuppression, and 51% underwent thymectomy (6% with radiotherapy). IVIg was given for crises in 27%. Mean motor score rose from 68 to 90 over 4 years; 58% of ocular-onset cases generalized, and 13% required ICU care.
Conclusions: MG in this Moroccan cohort predominantly affected young women, presented mainly with ocular symptoms, showed a high thymoma rate, and achieved substantial functional recovery under standardized management. These findings refine regional epidemiology and emphasize earlier detection and structured long-term immunotherapy.

KEYWORDS

Myasthenia gravis; Epidemiology; Thymoma; Morocco

MAIN ARTICLE

INTRODUCTION

Myasthenia gravis (MG) is an antibody-mediated disorder of the neuromuscular junction most commonly driven by immunoglobulins targeting the acetylcholine receptor (AChR) or, less frequently, muscle-specific kinase (MuSK) and LRP4. Its prevalence and age-specific incidence have risen over recent decades, partly due to heightened awareness, improved diagnostics, and decreased mortality. **[1–3]** MG shows a bimodal age distribution with early-adult female and late-onset male peaks, while thymic disease and coexisting autoimmunity shape phenotype and management. **[1,4,5]**High-quality data from North Africa are sparse. We report a 10-year, single-center cohort from Meknès, Morocco, characterizing epidemiology, clinical features, investigations, treatments, and outcomes.

METHODS

Study Design and Setting

We performed a retrospective, descriptive cohort study at the **Neurology Department, Moulay Ismail Military Hospital, Meknès, Morocco**, covering **March 2015–March 2024**. The service is a regional referral center for active-duty personnel, retirees, beneficiaries .

Participants

We included all patients with a clinical diagnosis of MG who were followed and treated at our department during the study window. Exclusions were: hospitalization outside the study period, irregular follow-up after discharge, or incomplete clinical/radiologic records.

Data Sources and Variables

From archived, standardized case forms we abstracted: age, sex, category (military/ civil/beneficiary) , time from symptom onset to diagnosis, presenting systems (ocular, bulbar, limb, respiratory), MGFA class at admission, motor score (Annex-based scale), electrophysiology (repetitive-stimulation EMG), immunology (AChR; MuSK in AChR-seronegative), thoracic imaging (radiograph/CT), treatment (anticholinesterases; corticosteroids; steroid-sparing immunosuppressants; thymectomy approach and adjuvant radiotherapy; IVIg for crisis), and longitudinal outcomes (motor score trajectory; serologic control; ICU admission; ocular-to-generalized conversion).

Ethics

Data collection adhered to institutional standards with full de-identification

RESULTS

Cohort Overview

Thirty-three patients met inclusion criteria; **23 (70%) were female** and **10 (30%) male** (female:male ratio 2.3). The mean age at **symptom onset** was **34 years** (1–55). The **median diagnostic delay** was **2 years 3 months**.

Clinical Presentation and Severity

Initial manifestations were **ocular in 87%** (ptosis/diplopia), **bulbar in 54%** (dysphagia, dysphonia, mastication), **limb/axial fatigability in 39%**, and **respiratory in 18%**. At admission, **42%** were **MGFA class I**, **27%** class IIa, **21%**class IIb, **6%** class IIIa, and **3%** class IVa.

Electrophysiology and Serology

Repetitive-stimulation EMG demonstrated a neuromuscular junction decrement in **16/33 (48%)**. **AChR antibodies** were positive in **25/33 (75%)**. Among eight AChR-seronegative patients tested, **anti-MuSK was negative in all**.

Imaging

Thoracic radiography was normal in most cases, but **CT identified thymoma in 12/33 (36%)** and **thymic hyperplasia in 6/33 (18%)**; **15/33 (46%)** had normal CT.

Treatment

All patients received **anticholinesterases** (pyridostigmine or ambémonium) . **Corticosteroids** were initiated in **11/33 (33%)**; **5/33 (15%)** required **steroid-sparing immunosuppression** (e.g., azathioprine). **Thymectomy** was performed in **17/33 (51%)** (60% trans-sternal, 40% transcervical); **2/33 (6%)** received adjuvant radiotherapy for malignant thymoma. **IVIg** (0.4 g/kg/day for 3–5 days) was administered for myasthenic crises in **9/33 (27%)**.

Outcomes

The **mean motor score** improved from **68** at baseline (range 38–92) to **78** at 3 months, **89** at 2 years, and **90** at 4 years (upper range 100). Repeat AChR testing (available in 20 patients; mean 2.3-year interval) normalized in all tested. Among ocular-onset cases (**12/33; 36%**), **7/12 (58%)** generalized by two years; **5/12** remained ocular-restricted. **ICU**

admission occurred in **4/33 (13%)** during crises. At first post-treatment visit, **39%** reported marked improvement, **33%** partial improvement, and **15%** worsening.

Table 1. Baseline characteristics and presentation (N=33)

Feature	Value
Female sex	23 (70%)
Mean age at onset	34 years (range 1–55)
Median diagnostic delay	2 years 3 months
Ocular symptoms at onset	29 (87%)
Bulbar symptoms	18 (54%)
Limb/axial fatigability	13 (39%)
Respiratory symptoms	6 (18%)
MGFA at admission	I: 14 (42%); IIa: 9 (27%); IIb: 7 (21%); IIIa: 2 (6%); IVa: 1 (3%)

Table 2. Key investigations, treatments, and outcomes

Domain	Metric	Result
Electrophysiology	Repetitive-stimulation decrement	16/33 (48%)
Serology	AChR Ab positive	25/33 (75%)
	Anti-MuSK (tested in 8 AChR-neg.)	0/8 positive
Imaging	Thoracic CT: normal	15/33 (46%)
	Thymoma	12/33 (36%)
	Thymic hyperplasia	6/33 (18%)
Treatment	Any anticholinesterase	33/33 (100%)
	Corticosteroids required	11/33 (33%)
	Added immunosuppressant	5/33 (15%)
	Thymectomy	17/33 (51%); 2 with adjuvant RT
Crisis care	IVIg during crises	9/33 (27%)
Outcomes	Mean motor score	68 → 90 (baseline → 4 years)
	Ocular-to-generalized conversion	7/12 (58%) by 2 years
	ICU admission	4/33 (13%)

DISCUSSION

This 10-year Moroccan cohort illustrates key global MG patterns—female predominance with early-adult onset, frequent ocular presentation, and meaningful functional improvement under contemporary care—while adding region-specific data on thymic pathology and treatment utilization.

Epidemiology and age–sex distribution**.**

Our female:male ratio (2.3) and mean onset age (34 years) align with the recognized bimodality and earlier female peak. **[1,4]** The median diagnostic delay (>2 years) remains clinically important, echoing literature that delays are common when symptoms are ocular-predominant or fluctuate. Early referral pathways and standardized diagnostic bundles (bedside fatigability signs, ice test where relevant, RNS/Single-fiber EMG, and antibody panels) could reduce latency. **[1,6]**

Clinical spectrum and severity.

Ocular manifestations dominated (87%), with over half exhibiting bulbar signs. Although our MGFA distribution skewed toward milder classes, **58%** of ocular-onset cases generalized by two years, consistent with prior series reporting high conversion within 24 months absent immunomodulation. **[1,4]**

Electrophysiology and serology.

RNS was positive in 48% overall—within reported sensitivity ranges that favor facial/proximal muscles and improve with single-fiber EMG. **[6]** AChR positivity (75%) fits global cohorts; the absence of MuSK in tested AChR-negative cases underscores known phenotypic heterogeneity and the potential role for LRP4 or low-affinity AChR assays where accessible. **[2,3]**

Thymic pathology.

The **36% thymoma rate** is higher than the ~10–15% typically reported, possibly reflecting referral bias to a military tertiary center, imaging protocols, or case-mix. **[5]** Adjuvant radiotherapy in malignant histotypes and ICU transfers during crises among thymoma patients mirror published risk enrichment. **[5]**

Therapeutics and outcomes.

Universal anticholinesterase use, corticosteroid initiation in one-third, and escalation to azathioprine in 15% reflect practice patterns balancing efficacy with toxicity. **[7–9]** IVIg was pivotal in crises (27%), consistent with equivalence to plasma exchange for short-term stabilization. **[7] Thymectomy** in 51% aligns with imaging-driven indications (thymoma/hyperplasia). Evidence from randomized data supports thymectomy plus

prednisone for generalized, AChR-positive MG within defined windows, reducing steroid burden and exacerbations—effects seen as our cohort's motor scores improved substantially over four years. **[9]**

Strengths and limitations**.**

Strengths include a decade-long, single-center dataset with standardized abstraction, imaging confirmation for all, and longitudinal functional readouts. Limitations include modest sample size, single-center referral bias (military/beneficiaries), incomplete availability of advanced electrophysiology (single-fiber EMG) and extended antibody panels (LRP4/low-affinity AChR), and retrospective design precluding causal inference.

Implications.

Region-tailored MG pathways should emphasize (i) expedited diagnosis for ocular-dominant presentations, (ii) structured, steroid-sparing algorithms with proactive monitoring for cardiometabolic adverse effects, (iii) multidisciplinary peri-operative management where thymic disease is present, and (iv) capability building for advanced immunodiagnostics. **[1–3,7–9]**

CONCLUSIONS

In this Moroccan single-center cohort, MG primarily affected women in early adulthood, presented most often with ocular features, and showed substantial functional improvement with contemporary, guideline-concordant therapy. The high thymoma yield underscores the value of systematic thoracic imaging. Earlier diagnosis and broader access to advanced electrophysiology and serology could further optimize outcomes. **[1–10]**

ACKNOWLEDGEMENTS

The authors have no acknowledgements to declare and report no conflicts of interest.

REFERENCES

1. Gilhus NE, Breiner A. Chapter Eight - Epidemiology of myasthenia gravis. In: Punga AR, Barnett-Tapia C, editors. International Review of Neurobiology [Internet]. Academic Press; 2025 [cited 2025 Nov 2]. p. 161-96. (Myasthenia Gravis: Part A; vol. 182). Available from: https://www.sciencedirect.com/science/article/pii/S0074774225000431 https://doi.org/10.1016/bs.irn.2025.04.028

2. Lazaridis K, Tzartos SJ. Autoantibody Specificities in Myasthenia Gravis; Implications for Improved Diagnostics and Therapeutics. Front Immunol. 2020 Feb 14;11:212. https://doi.org/10.3389/fimmu.2020.00212

3. Bril V, Gilhus NE. Aging and infectious diseases in myasthenia gravis. J Neurol Sci. 2025 Jan 15;468:123314. https://doi.org/10.1016/j.jns.2024.123314

4. Djordjevic IS, Peric S, Djordjevic SA, Lavrnic D, Marasevic K, Apostolski S, et al. Risk factors for generalization of ocular myasthenia gravis. Indian J Ophthalmol. 2025 Oct;73(10):1460-5. https://doi.org/10.4103/IJO.IJO_650_25

5. Priola AM, Priola SM. Imaging of thymus in myasthenia gravis: From thymic hyperplasia to thymic tumor. Clin Radiol. 2014 May 1;69(5):e230-45. https://doi.org/10.1016/j.crad.2014.01.005

6. Sonoo M, Uesugi H, Mochizuki A, Hatanaka Y, Shimizu T. Single fiber EMG and repetitive nerve stimulation of the same extensor digitorum communis muscle in myasthenia gravis. Clin Neurophysiol. 2001 Feb 1;112(2):300-3. https://doi.org/10.1016/S1388-2457(00)00544-7

7. Pavlekovics M, Engh MA, Lugosi K, Szabo L, Hegyi P, Terebessy T, et al. Plasma Exchange versus Intravenous Immunoglobulin in Worsening Myasthenia Gravis: A Systematic Review and Meta-Analysis with Special Attention to Faster Relapse Control. Biomedicines. 2023 Nov 29;11(12):3180. https://doi.org/10.3390/biomedicines11123180

8. Yasir M, Goyal A, Sonthalia S. Corticosteroid Adverse Effects. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 [cited 2025 Nov 2]. Available from: http://www.ncbi.nlm.nih.gov/books/NBK531462/

9. Wolfe GI, Kaminski HJ, Aban IB, Minisman G, Kuo HC, Marx A, et al. Randomized Trial of Thymectomy in Myasthenia Gravis. N Engl J Med. 375(6):511-22.

10. Konan A, Kalyoncu U, Dogan I, Kiliç YA, Karakoç D, Akdogan A, et al. Combined Long-Term Steroid and Immunosuppressive Treatment Regimen in Granulomatous Mastitis. Breast Care. 2012 Aug;7(4):297-301. https://doi.org/10.1159/000341388