



## CLINICAL GUIDELINE

# Myasthenia Gravis or Lambert-Eaton Myasthenia Syndrome, Medicines that may affect patients

A guideline is intended to assist healthcare professionals in the choice of disease-specific treatments.

Clinical judgement should be exercised on the applicability of any guideline, influenced by individual patient characteristics. Clinicians should be mindful of the potential for harmful polypharmacy and increased susceptibility to adverse drug reactions in patients with multiple morbidities or frailty.

If, after discussion with the patient or carer, there are good reasons for not following a guideline, it is good practice to record these and communicate them to others involved in the care of the patient.

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<b>Approval Group:</b>	Medicines Utilisation Subcommittee of ADTC
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### Important Note:

The online version of this document is the only version that is maintained. Any printed copies should therefore be viewed as 'Uncontrolled' and as such, may not necessarily contain the latest updates and amendments.

Information for healthcare professionals

## **Medicines that may affect patients with Myasthenia Gravis or Lambert-Eaton Myasthenic Syndrome**

There are certain medicines that have been reported to worsen or induce myasthenia gravis (MG), often by increasing muscular weakness, and should be used with caution in patients with this condition. The list of medicines in table 1 has been compiled to assist prescribers in the decision making process when prescribing medicines for patients with myasthenia gravis.

The medicines in this list have been classed according to those which should be:

- ▲ ▲ Absolutely contraindicated
- ▲ Avoided
- Used with caution
- Probably safe with patient monitoring.

This list is not exhaustive, best attempts have been made to identify problematic medicines but it is acknowledged that information may not be complete. If a medicine is not on the list it is not guaranteed that it will be safe in myasthenia gravis, please be vigilant with new medicines where safety in myasthenia gravis may be lacking. It is important that patients and doctors be alert to the early signs of an exacerbation of myasthenia gravis (MG) when a new medicine is commenced, even if it is not on the list or is listed as probably safe.

If further advice is required this can be obtained from the neurology pharmacy team ([ggc.neuro.pharmacy@nhs.scot](mailto:ggc.neuro.pharmacy@nhs.scot)) or the on call neurology registrar who can be contacted via switchboard.

Table 1: Medicines that may affect patients with Myasthenia Gravis or Lambert Eaton Myasthenic Syndrome

Avoid ▲	Caution ■	Probably Safe ●
<b>Gastrointestinal</b>		
<p><b>Co-phenotrope</b> ▲</p> <p><b>Magnesium containing antacids/laxatives</b> ▲</p> <p><b>Antimuscarinics<sup>(a)</sup></b> ▲ Hyoscine (hydrobromide and butylbromide), dicycloverine</p> <p><b>Anti-emetics</b> ▲ Cinnarizine, promethazine</p>	<p><b>H2-receptor antagonists</b> ■</p> <p><b>Anti-emetics</b> ■ Prochlorperazine, levomepromazine, droperidol</p>	<p><b>Antimuscarinics</b> Propantheline ● (this is routinely used to counteract the side effects of pyridostigmine)</p>
<b>Cardiovascular</b>		
<p><b>Anti-arrhythmics<sup>(b)</sup></b> ▲ Procainamide, disopyramide, propafenone, quinidine</p>	<p><b>Anti-arrhythmics</b> ■ Flecainide, amiodarone, dronedarone, lidocaine</p> <p><b>Anti-platelets</b> ■ Dipyridamole (may counteract the effect of pyridostigmine)</p> <p><b>Beta-blockers<sup>(a)</sup></b> ■ (class effect including ophthalmic preparations)</p> <p><b>Calcium Channel Blockers</b> ■ (class effect)</p> <p><b>Diuretics</b> ■ (class effect, monitor electrolytes)</p> <p><b>Methyldopa</b> ■</p> <p><b>Statins</b> ■ (class effect)</p>	
<b>Respiratory</b>		
<p><b>Sedating antihistamines</b> ▲ Alimemazine, chlorphenamine, cyproheptadine, hydroxyzine, ketotifen, promethazine</p> <p><b>Glycopyrronium</b> ▲</p>	<p><b>Corticosteroids (inhaled)</b> ■ Caution if high dose, probably safe at lower doses</p>	<p><b>Antimuscarinics (inhaled)</b> ● – probably safe due to minimal systemic absorption</p>

**Prescribing notes:**

- a) Do not stop if stable on treatment – discuss with neurology
- b) If this medicine is clinically indicated and no alternative exists, seek specialist advice
- c) This is a muscle relaxant and may aggravate myasthenic weakness, discuss with neurology if considering use
- d) Prescription of immune checkpoint inhibitors in patients with myasthenia may be undertaken on a case by case basis after careful discussion between neurologist, oncologist and patient, if other treatments not available.
- e) Use may be considered on a case by case basis – discuss with neurology
- f) Small number of case reports of myasthenia gravis in association with hepatitis B vaccination but more evidence needed to determine if causative effect

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<b>Nervous System</b>		
Epilepsy and other seizure disorders		
	<b>Anti-epileptics ■</b> Carbamazepine, Ethosuximide, Gabapentin, Phenobarbitone, Phenytoin, Thiopental <sup>(c)</sup>	<b>Anti-epileptics ●</b> Levetiracetam, Lamotrigine, Sodium Valproate
Mental health disorders		
<b>Benzodiazepines ▲</b> (class effect)	<b>Antipsychotics ■</b> (class effect, includes first and second generation)  <b>Buspirone ■</b>  <b>Lithium ■</b>  <b>Monoamine-Oxidase Inhibitors ■</b> Isocarboxacid, phenelzine, tranylcypromine  <b>Tricyclic antidepressants ■</b> (class effect)	
Movement disorders		
<b>Orphenadrine ▲</b> <b>Procyclidine ▲</b> <b>Trihexyphenidyl ▲</b>  <b>Botulinum Toxin ▲</b>	<b>Amantadine ■</b>	
Nausea and labyrinth disorders		
<b>Anti-emetics ▲</b> Cinnarizine, promethazine	<b>Anti-emetics ■</b> Prochlorperazine, levomepromazine, droperidol	
Pain		
<b>Strong opioids ▲</b> (class effect)	<b>Weak opioids ■</b> (class effect, includes tramadol)	<b>Paracetamol ●</b>
Migraine		
	<b>Pizotifen ■</b> <b>Eletriptan ■</b>	
Sleep disorders		
<b>Benzodiazepines ▲</b> (class effect)  <b>Zopiclone, Zolpidem, Eszopiclone ▲</b>  <b>Diphenhydramine (Nytol®) ▲</b>	<b>Chloral hydrate ■</b>  <b>Clomethiazole ■</b>  <b>Melatonin ■</b>  <b>Modafinil ■</b>	
Nicotine dependence		
	<b>Nicotine replacement ■</b>	

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<b>Infection</b>		
<b>▲▲ Telithromycin is Absolutely Contraindicated</b>		
<p><b>Aminoglycosides<sup>(b)</sup> ▲</b> Gentamicin, amikacin, tobramycin, streptomycin, neomycin</p> <p><b>Antimalarials ▲</b> Chloroquine, mefloquine, quinine</p> <p><b>Polymyxins ▲</b> Colistimethate sodium</p> <p><b>Ribavirin ▲</b></p>	<p><b>Macrolides ■</b> Clarithromycin, erythromycin, azithromycin</p> <p><b>Penicillins ■</b> Ampicillin</p> <p><b>Quinolones ■</b> Ciprofloxacin, delafloxacin, levofloxacin, moxifloxacin, norfloxacin, ofloxacin</p> <p><b>Tetracyclines ■</b> Doxycycline, evracycline, lymecycline, minocycline, oxytetracycline, tetracycline, demeclocycline</p> <p><b>Cefoxitin ■</b></p> <p><b>Clindamycin ■</b></p> <p><b>Co-trimoxazole ■</b> (sulphonamides)</p> <p><b>Imipenem-cilastin ■</b></p> <p><b>Nitrofurantoin ■</b></p> <p><b>Rifampicin ■</b></p> <p><b>Vancomycin ■</b></p> <p><b>Ritonavir ■</b></p>	<p><b>Aztreonam ●</b></p> <p><b>Ceftriaxone ●</b></p> <p><b>Meropenem ●</b></p> <p><b>Metronidazole ●</b></p> <p><b>Penicillins</b> (except ampicillin) ●</p> <p><b>Trimethoprim ●</b></p> <p><b>Aciclovir ●</b></p>
<b>Endocrine</b>		
<p><b>Levothyroxine ▲</b> Avoid over replacement</p>	<p><b>Corticosteroids ■</b> (commonly used to treat MG. Sudden increases in dose could exacerbate symptoms – please consult neurology)</p> <p><b>Bisphosphonates ■</b></p> <p><b>Oestrogens/Progestogens ■</b> Hormonal changes may affect MG symptoms</p>	<p><b>Tetracosactide (for diagnostic use as Short Synacthen Test) ●</b> can be performed with monitoring</p>

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<b>Genito-urinary</b>		
<p><b>Antimuscarinics ▲</b> Darifenacin, fesoterodine, flavoxate, oxybutynin, propiverine solifenacin, tolterodine, trospium</p> <p>(solifenacin may be safest of drug class, please discuss with neurology)</p>	<p><b>Apha-adrenoceptor blockers ■</b> Alfuzosin, doxazosin, indoramin, prazosin, tamsulosin, terazosin</p> <p><b>Oestrogens/Progestogens ■</b> Hormonal changes may affect MG symptoms</p>	
<b>Immune system and malignant disease</b>		
<b>Discussion with neurology advised prior to commencing chemotherapy in myasthenic patient</b>		
	<p><b>Aldesleukin, busulfan, cisplatin, doxorubicin, etoposide, fludarabine, fluorouracil, mitotane, paclitaxel ■</b></p> <p><b>Immune Checkpoint Inhibitors: (d) ■</b> atezolizumab, avelumab, cemiplimab, durvalumab, dostarlimab, ipilimumab, nivolumab, pembrolizumab, tremelimumab</p> <p><b>Oestrogens/Progestogens ■</b> Hormonal changes may affect MG symptoms</p> <p><b>Interferon (alpha and beta) ■</b></p> <p><b>Glatiramer ■</b></p>	
<b>Blood and Nutrition</b>		
<p><b>Magnesium supplements ▲</b> (unless treating hypomagnesaemia)</p>	<p><b>Desferrioxamine ■</b></p> <p><b>Sodium lactate ■</b></p> <p><b>Trientene ■</b></p>	
<b>Musculoskeletal</b>		
<p><b>Rheumatology</b> Penicillamine ▲ Hydroxychloroquine ▲</p> <p><b>Colchicine ▲</b></p> <p><b>Muscle Relaxants (c) ▲</b> methocarbamol</p> <p><b>Quinine ▲</b></p>	<p><b>Etanercept ■</b></p> <p><b>Muscle Relaxants (c) ■</b> Baclofen, dantrolene, tizanidine</p> <p><b>Riluzole ■</b></p>	<p><b>Ibuprofen ●</b></p> <p><b>Naproxen ●</b></p>

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<b>Avoid ▲</b>	<b>Caution ■</b>	<b>Probably Safe ●</b>
<b>Eye</b>		
<b>Polymyxin or bacitracin containing preparations ▲</b>  <b>Aminoglycoside eye drops ▲</b>	<b>Antimuscarinic eye drops ■</b> atropine, cyclopentolate, tropicamide  <b>Beta-blocker eye drops ■</b>  <b>Carbonic anhydrase inhibitors (oral and ophthalmic) ■</b> Acetazolamide, brinzolamide, dorzolamide  <b>Corticosteroid eye drops ■</b> <b>Local anaesthetic eye drops ■</b> <b>Macrolide eye drops ■</b> <b>Quinolone eye drops ■</b>	
<b>Ear, nose and oropharynx</b>		
<b>Polymyxin or bacitracin containing preparations ▲</b>  <b>Aminoglycosides (ear and nose) ▲</b>	<b>Corticosteroids (ear, nose and oropharynx) ■</b>  <b>Lidocaine (oropharynx) ■</b>	
<b>Skin</b>		
<b>Polymyxin or bacitracin containing preparations ▲</b>  <b>Aminoglycosides (topical) ▲</b>	<b>Clindamycin (topical) ■</b>  <b>Corticosteroids (topical) ■</b>  <b>Imiquimod ■</b>  <b>Macrolides (topical) ■</b>	<b>Antimuscarinics (topical) ●</b>
<b>Vaccines</b>		
<b>Yellow fever vaccine ▲<sup>(e)</sup></b>  <b>Avoid live vaccines if on immunosuppression ▲</b>	<b>Hepatitis B vaccine<sup>(f)</sup> ■</b>	

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Avoid ▲	Caution ■	Probably Safe ●
<b>Anaesthesia</b>		
<b>Discussion with neurology advised prior to myasthenic patient undergoing anaesthesia</b>		
<b>Muscle Relaxants –</b> dantrolene* ▲  (*preferably avoid but if cannot be avoided monitor carefully for MG worsening)	<b>Inhalational agents</b> ■ myasthenic patients require smaller amounts of these agents <b>Depolarising drugs</b> ■ variable response in myasthenia gravis <b>Non-depolarising drugs</b> ■ myasthenic patients are particularly sensitive to these agents <b>Local anaesthetics</b> ■ myasthenic patients require smaller amounts of these agents <b>Antimuscarinics</b> ■ Atropine, glycopyrronium	<b>Propofol</b> (c) ●
<b>Emergency treatment of poisoning</b>		
	<b>Pralidoxime chloride</b> ■	
<b>Miscellaneous</b>		
<b>Illicit drugs</b> ▲  <b>Herbal Remedies:</b> ▲ consult neurology team if considering herbal or alternative medicines, CBD preparations or OTC medicines	<b>Iodinated Contrast Media</b> ■	

## References

The following references have been used to compile this list in conjunction with local expert opinion:

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