CASE REPORT

Inappropriate Dexamethasone Use by a Trekker in Nepal: A Case Report

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We present a case of inappropriate dexamethasone use in a trekker in the Everest region of Nepal. We aim to increase awareness among health professionals of the possible use of this medication by trekkers and promote knowledge of potential complications. In this case, a previously altitude-naïve trekker was prescribed prophylactic dexamethasone by physicians in a Western travel clinic before high-altitude trekking in Nepal. There were no indications for prophylactic medication nor for the use of dexamethasone. The trekker reported that no discussion regarding risks and benefits, alternatives, side effects, contraindications, or dose tapering on completion of the course had occurred before travel. Side effects were temporary, but serious complications may have ensued if it not for timely interventions by doctors at the International Porter Protection Group rescue post. The events leading to inappropriate dexamethasone use in this case cannot be known for certain. However, it is clear that the trekker lacked the knowledge to use the medication safely. Although the efficacy of dexamethasone in the prevention of acute mountain sickness is undisputed, associated side effects and other limitations make acetazolamide the prophylactic drug of choice. Inappropriate use of dexamethasone can lead to severe complications, and such a case has been reported from Mount Everest. Clinicians prescribing dexamethasone must understand the indications and risks, and health professionals at altitude should be aware of its use by trekkers and the potential complications.

Keywords: dexamethasone, altitude, drugs, prophylactic, medication, illness

Introduction

High-altitude environments are increasingly easy to access; as a result, travel to these regions has markedly increased.¹ In the case of Nepal, the number of tourists visiting for the purpose of trekking or mountaineering has surpassed 100,000 per year in recent years.² The risk of developing high-altitude illness (HAI) is implicit in such travel, and prevention is a priority. Although the most effective strategy is a gradual ascent rate,^{3,4} an increasing number of climbers and trekkers are using pharmaceuticals.⁵ The role of prophylactic medication in this setting has been described in a number of guidelines, and although ethical debate remains^{6,7} the position of acetazolamide as the first-line agent is clearly defined.^{8–10} As such, with the exception of a few

uncommon circumstances such as intolerance or allergy, acetazolamide is the drug of choice for those who decide to use medication to reduce the risk of developing acute mountain sickness (AMS).

The practical role of dexamethasone as a prophylactic agent is less clear. Although demonstrated to be of benefit in the prevention of AMS,^{11,12} associated side effects and risks limit its use to a few special situations.^{8,9} Inappropriate use is particularly high risk, and a case report concerning a climber on Mount Everest highlights the plethora of complications that can ensue.¹³

High-altitude mountaineering is a high-risk activity¹⁴ that has a longstanding relationship with prophylactic medications and performance-enhancing drugs.⁶ Climbers are often at the extremes of their physiologic reserve, and the gains from medications can be significant. Trekking, on the other hand, is a far less dangerous activity.¹⁵ Therefore, any risk associated with using these medications comprises a far higher proportion of the overall risk of the trip. In addition,

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the benefits from these medications are often minimal and are not required to complete the trek if adequate ascent profiles are followed.

We describe a case of potentially dangerous dexamethasone use in a trekker who presented to the International Porter Protection Group (IPPG) rescue post in the Gokyo Valley of the Khumbu region, Nepal, in 2016. The case highlights the potential pitfalls of prescribing dexamethasone as a prophylactic medication. We aim to increase awareness among health professionals of the possible use of this medication among trekkers and to promote knowledge of its potential complications.

Case

During the 2016 premonsoon trekking season, a fit and healthy 54-year-old Western man visited the IPPG rescue post at Gokyo (4750 m). He was on his first sojourn to high altitude. Prompted by a discussion with a fellow trekker, he attended the IPPG post with concerns regarding his HAI prophylactic medication. Before travel, he attended a travel clinic in his home country. During this consultation, he inquired about prophylaxis for altitude sickness, and the physician prescribed dexamethasone. The patient reported that during the consultation there was no discussion regarding risks and benefits, potential alternatives, side effects, contraindications, or dose tapering on completion of the course. He also assumed he was taking the same medication as his trekking companion—acetazolamide (Diamox). As per instructions from his physician, he started taking dexamethasone on arrival in Kathmandu, considering dexamethasone to be identical to his friend's Diamox.

The patient flew from Kathmandu to Lukla airport to start his trek. When he reached the IPPG rescue post, he had been trekking for 16 days and had been taking dexamethasone for 18 days (2 mg twice a day for 9 days and a further 9 days of 4 mg twice a day). He planned to stop the drug with no tapering of dose at approximately 3500 m on his descent to Lukla airport—a 21-day course of dexamethasone having been completed at that point. The patient had no drug allergies or intolerances nor any other contraindications to acetazolamide. His ascent profile during the trek was consistent with current guidelines.⁸

The patient described very poor sleep since arrival in Kathmandu—going to sleep at 7 PM and waking at 10 PM every night with no further periods of sleep. When asked whether he felt this was unusual, he stated that he thought this was “weird but due to altitude.” He stated that he felt “great” with “lots of energy” and “no fatigue” compared with his fellow travellers. He described “elated mood” and put this down to the “excitement of traveling in Nepal.”

The patient also reported 2 episodes of syncope. The first occurred ascending Kalar Patar (circa 5600 m) alone at 4 AM in the morning because he could not sleep. On this occasion, his only preceding symptom was mild dizziness before finding himself lying on the ground. He reported a loss of consciousness and subsequent head injury sustained on falling; an abrasion was still visible over his left forehead. The patient recovered orientation rapidly after regaining consciousness and was helped to his feet by passers-by. Despite this episode, he continued climbing for 30 minutes more before deciding he felt strange and descending. A second, similar episode of syncope occurred while ascending Gokyo Ri (5357 m). He had no history of syncope or presyncope. Follow-up in his home country revealed no underlying pathology, and he has had no further episodes to date.

Physical examination at 4800 m was normal (heart rate, 76 beats/min; blood pressure, 118/80 mm Hg; respiratory rate, 16 breaths/min; peripheral arterial haemoglobin oxygen saturations, 87% on room air [acceptable at 4800 m]; temperature, 36.8°C; blood glucose, 4.4 mmol/L), and no peripheral stigmata of steroid toxicity were identified.

We discussed altitude illness, prevention of altitude sickness, and the role of dexamethasone in the mountains with the patient. Because the patient had been on dexamethasone for >14 days, he was provided with a dose-tapering protocol, a 7-day course of ranitidine and additional dexamethasone tablets in the event of an Addisonian crisis on withdrawal of the medication. We also strongly advised him not to travel alone and to discuss the situation with his accompanying friend in case of complications. He has since had no problems, and clinical evaluation by a physician on return to his home country was normal.

Discussion

This single case study describes unsafe dexamethasone use by a trekker in Nepal. Although unsafe dexamethasone use has been described on Mount Everest,¹³ we are not aware of any previous published examples in high-altitude trekkers. Whether this case report represents an isolated case or a developing phenomenon is unclear. Concerns that medication use among mountaineers is increasing¹⁶ have not been supported by recent studies,^{17,18} and no such studies have been carried out in high-altitude trekkers.

Clinicians should be cautious for a number of reasons when considering dexamethasone as an HAI prophylactic medication in trekkers. First, compared with acetazolamide, dexamethasone is a more complicated medication to use safely due to risks associated with

inaccurate course adherence and a number of drug interactions. Accurate adherence to prescriptions cannot be expected,¹⁹ and travellers may be at particularly high risk of poor medication adherence.²⁰ Most notably, trekkers who decide to stop dexamethasone while at altitude are at risk of developing rebound phenomena,⁹ leading to severe, even life-threatening, HAI. Trekkers who take dexamethasone for prolonged periods can develop complications associated with chronic steroid use.¹³ A number of drug interactions (at least 853⁵) further complicate safe medication use. Perhaps most relevant is the significantly increased risk of developing peptic ulcers when taking nonsteroidal anti-inflammatory drugs (commonly taken by trekkers) and dexamethasone combined compared with taking nonsteroidal anti-inflammatory drugs alone.²¹

Second, common side effects of dexamethasone can be more disruptive to a trek than symptoms of mild to moderate AMS. For example, our patient reported only sleeping 3 hours a night, every night, for over 2 weeks, a degree of sleep disturbance considerably more severe than usually experienced with mild AMS or altitude-related sleep disorder.²² Furthermore, the patient reported feeling “energetic” despite his insomnia, a symptom not in keeping with AMS. Dexamethasone-related insomnia is a common side effect and not altitude dependent. A study in Toronto (<100 m above sea level) found that just under half (45%) of patients who took the medication experienced moderate to severe sleep disturbance.²³ In contrast, acetazolamide can improve altitude sleep-related disorder and does not induce insomnia. Post-dexamethasone depression is also common, with a number needed to harm of just 4.²⁴

Third, and of greater concern, are the potential consequences of side effects in remote high-altitude environments. In this case, hypomania may have contributed to the decision to trek alone at 4 AM at 5000 m. The associated episodes of syncope, although most likely secondary to altitude,²⁵ resulted in a scenario potentially more dangerous than a well-managed episode of AMS. Cognition is known to be impaired at altitude,²⁶ and it seems unwise to use medication that can potentially alter mood and adversely influence decision making.

Dexamethasone requires careful counselling and education before prescription to ensure the patient clearly understands how to use the medication safely. We cannot be certain of the exact details of how inappropriate dexamethasone use occurred in this case. The patient's account is highly suggestive of inappropriate prescribing and counselling; however, one must allow for the possibility of incomplete or inaccurate patient recall. If adequate pretravel consultation did take place, the case demonstrates the difficulties of successfully

ensuring trekkers have the knowledge and understanding needed to use dexamethasone safely.

Indications for prophylactic dexamethasone are limited to those who are intolerant or allergic to acetazolamide. In this very small cohort, the risks and benefits of using dexamethasone should be fully discussed. It is vital that health practitioners provide accurate and, where possible, evidence-based information to trekkers. In particular, the risks and benefits of dexamethasone need to be effectively discussed.

Given the potential dangers associated with dexamethasone misuse, further work is needed to accurately evaluate the prevalence of its use and misuse amongst trekkers. We propose that a survey over a single season in the Khumbu region would provide insight into this currently unanswered question.

Conclusion

We report a case of inappropriate dexamethasone use in a high-altitude trekker. Misuse of dexamethasone is potentially dangerous, and all clinicians prescribing dexamethasone must understand the indications and risks. Health professionals working at altitude should be aware of the possible use of dexamethasone by trekkers and the potential complications. Currently, the prevalence of dexamethasone use and misuse among trekkers in Nepal is unknown. We suggest this area requires further research to assess whether this case is unique or representative of a developing phenomenon.

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References

1. Mieske K, Flaherty G, O'Brien T. Journeys to high altitude—risks and recommendations for travelers with preexisting medical conditions. *J Travel Med.* 2010;17:48–62.
2. Bhattarai PC, Sharma SK, Sigdel R, et al. *Nepal Tourism Statistics 2013*. Kathmandu, Nepal: Ministry of Culture, Tourism & Civil Aviation. Planning & Evaluation Division. Statistical Section; 2014. Available at: www.tourismdepartment.gov.np/files/download/6e3a3bdd4e069e5. Accessed May 2017.
3. Hackett PH, Roach RC. High-altitude illness. *N Engl J Med.* 2001;345:107–114.
4. Bärtsch P, Swenson ER. Acute high-altitude illnesses. *N Engl J Med.* 2013;368:2294–2302.
5. Donegani E, Paal P, Küpper T, et al. Drug use and misuse in the mountains: a UIAA MedCom consensus guide for medical professionals. *High Alt Med Biol.* 2016;17:157–184.

6. Wagner DR. Medical and sporting ethics of high altitude mountaineering: the use of drugs and supplemental oxygen. *Wilderness Environ Med.* 2012;23:205–206.
7. Cushing TA, McIntosh SE, Keyes LE, et al. Performance-enhancing drugs—commentaries. *Wilderness Environ Med.* 2012;23:207–211.
8. Luks AM, McIntosh SE, Grissom CK, et al. Wilderness medical society practice guidelines for the prevention and treatment of acute altitude illness: 2014 update. *Wilderness Environ Med.* 2014;25:S4–S14.
9. Zafren K. Prevention of high altitude illness. *Travel Med Infect Dis.* 2014;12:29–39.
10. Kupper T, Gieseler U, Angelini C, Hillebrandt D, Milledge J. Emergency field management of acute mountain sickness, high altitude pulmonary edema, and high altitude cerebral edema: intended for doctors, interested non-medical persons and trekking or expedition operators. UIAA MedCom Consensus Statement No.2: Field Management of AMS, HAPE, HACE Bern, Switzerland: The International Mountaineering and Climbing Federation; 2012.
11. Hackett PH, Roach RC, Wood RA, et al. Dexamethasone for prevention and treatment of acute mountain sickness. *Aviat Space Environ Med.* 1988;59:950–954.
12. Tang E, Chen Y, Luo Y. Dexamethasone for the prevention of acute mountain sickness: systematic review and meta-analysis. *Int J Cardiol.* 2014;173:133–138.
13. Subedi BH, Pokharel J, Goodman TL, et al. Complications of steroid use on Mt. Everest. *Wilderness Environ Med.* 2010;21:345–348.
14. Huey RB, Eguskitza X. Limits to human performance: elevated risks on high mountains. *J Exp Biol.* 2001;204:3115–3119.
15. Shlim DR, Gallie J. The causes of death among trekkers in Nepal. *Int J Sports Med.* 1992;13:S74–S76.
16. Hillebrandt D, Kupper T, Donegani E, et al. Drug use and misuse in mountaineering. UIAA MedCom Standard No.22a Bern, Switzerland: The International Mountaineering and Climbing Federation; 2014.
17. Luks AM, Grissom C, Freer L, Hackett P. Medication use among Mount Everest climbers: practice and attitudes. *High Alt Med Biol.* 2016;17:315–322.
18. Robach P, Trebes G, Lasne F, et al. Drug use on Mont Blanc: a study using automated urine collection. *PLoS One.* 2016;11:e0156786.
19. Osterberg L, Blaschke T. Adherence to medication. *N Engl J Med.* 2005;353:487–497.
20. Landry P, Iorillo D, Darioli R, Burnier M, Genton B. Do travelers really take their mefloquine malaria chemoprophylaxis? Estimation of adherence by an electronic pillbox. *J Travel Med.* 2006;13:8–14.
21. Piper JM, Ray WA, Daugherty JR, Griffin MR. Corticosteroid use and peptic ulcer disease: role of nonsteroidal anti-inflammatory drugs. *Ann Intern Med.* 1991;114:735–740.
22. Weil JV. Sleep at high altitude. *High Alt Med Biol.* 2004;5:180–189.
23. Vardy J, Chiew KS, Galica J, Pond GR, Tannock IF. Side effects associated with the use of dexamethasone for prophylaxis of delayed emesis after moderately emetogenic chemotherapy. *Br J Cancer.* 2006;94:1011–1015.
24. Dumont L, Mardirosoff C, Tramèr MR. Efficacy and harm of pharmacological prevention of acute mountain sickness: quantitative systematic review. *BMJ.* 2000;321:267–272.
25. Nicholas R, O'Meara PD, Calonge N. Is syncope related to moderate altitude exposure? *JAMA.* 1992;268:904–906.
26. Virués-Ortega J, Buéla-Casal G, Garrido E, Alcázar B. Neuropsychological functioning associated with high-altitude exposure. *Neuropsychol Rev.* 2004;14:197–224.