Case reports

Lion's mane jellyfish (*Cyanea capillata*) envenoming presenting as suspected decompression sickness

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Abstract

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Lion's mane jellyfish stings are usually characterised by local inflammation, especially weals. Systemic symptoms are not widely described although there is a well known fictional description of a fatal reaction to envenoming. We describe five divers presenting with suspected decompression sickness, where the probable diagnosis was jellyfish envenoming.

Introduction

Lion's mane jellyfish (LMJ, *Cyanea capillata*) occur widely throughout boreal waters (Figure 1).[1] They are the largest jellyfish known and can have tentacles extending as much as 30 metres from the bell, which can be up to a metre across. The tentacles are covered with nematocysts which contain toxin. Lion's mane jellyfish have been identified with more than a thousand tentacles, each of which can have up to a quarter of a million nematocysts.[2]

In Orkney waters, it is relatively common, particularly in the summer months, for divers to come into contact with tentacles of LMJ either in the water or on shot lines. This can result in stings occurring around the regulator or in nematocyst deposition on dry suits which may result in toxin coming into contact with the diver's skin on de-kitting. In most cases the result of this contact is trivial although may result in local weals, erythema or swelling. Debate continues about the most effective local treatment for contact lesions with most convincing evidence suggesting local heat[3,4] whilst others recommend ice or baking soda.[5,6] Systemic symptoms are thought to be rare after envenoming although nausea, sweating, abdominal pain and muscular cramps have been described.[7] Autonomic neurotoxicity has been described as a feature of a number of jellyfish and marine venoms.[8] Anaphylaxis has been described following a second exposure.[9]

The only fatality we are aware of in association with LMJ envenoming is the fictional case described by Conan Doyle.[10] In this story, there is a description of a second near-fatal case of envenoming where pain, respiratory distress, sweating and cardiac symptoms are described, all features of Irukandji syndrome.[11] Lion's mane jellyfish are known to produce a variety of neuropeptide toxins but the effects of absorption of these toxins are largely unknown.

Decompression sickness (DCS) has protean manifestations. These include a variety of neurological symptoms and signs including numbness, weakness, paralysis, vestibular dysfunction, bladder dysfunction and confusion which may occur in isolation or in association with other features of DCS such as skin rashes, joint pain or constitutional symptoms. It is not infrequent that a presentation may be indistinct, especially in the recreational diving community where other pre-existing pathologies may make definitive diagnosis more difficult. It is appropriate that divers present for assessment in the event of symptoms potentially attributable to DCS and also appropriate that if DCS cannot be excluded, recompression treatment is undertaken.

There is considerable diving activity in the waters around Orkney, both commercial and recreational. The dive sites of Scapa Flow attract large numbers of recreational divers each year.[12] The Orkney hyperbaric unit manages on average between 15 and 20 cases of decompression illness (DCI) each year. Approximately a third of these cases have neurological symptoms either in isolation or alongside other symptoms or signs. We describe a series of divers who presented to us as cases of suspected decompression illness.

Figure 1
Lions mane jellyfish (*Cyanea capillata*); photo taken in the Orkney Islands by Penny Martin

Case series

CASE 1

A 27-year-old man undertook a 31-minute (min) dive to a maximum depth of 25 metres' sea water (msw) breathing nitrox25. During the dive he saw LMJ in the water and was aware of tentacles around his regulator with a tingling sensation around his lips. On surfacing he felt continued tingling around his lips and had visible local swelling. Ten minutes later he experienced pinprick sensations in all of his limbs which were fleeting and migratory. On de-kitting he felt irritation around his left wrist where he subsequently noticed a transient red patch. He was treated with oxygen (O_2) on the dive boat, noticing no difference in his symptoms. He presented to the diving medical team two and a half hours after surfacing. On examination, apart from swelling around his lips, there were no abnormal signs. He was treated with surface oxygen and an antihistamine and observed. His symptoms gradually subsided and he was discharged.

CASE 2

A 61-year-old man undertook a 35-min dive to a maximum depth of 34 msw breathing air. During a safety stop at 6 msw he noticed an intense pain across his top lip and left cheek. He was aware of jellyfish in the water around the shot line. On surfacing, 10–15 min later he noticed fleeting pinprick sensations from his neck to his toes. These symptoms persisted and the dive-boat skipper treated him with O_2, without any change in his symptoms. He was referred to the diving medical team. By the time he arrived some five hours after surfacing, his symptoms had substantially improved. Physical examination was unremarkable and no other treatment was required. On review the following morning his symptoms had completely resolved.

CASE 3

A 21-year-old man undertook a 36-min dive to a maximum depth of 27 msw, breathing nitrox27. This was the first dive of his holiday. He was aware of LMJ in the water and tentacles around his regulator as he was going down the shot line. During his dive he noticed a tingling sensation around his lips which persisted on surfacing. An hour or so later he noticed pinprick tingling in both arms, axillae, across his abdomen and in both legs. He felt light-headed and hot. Several hours later, with the pinprick sensations persisting, he consulted a doctor who was supervising his party. On advice, he presented to medical care six hours after surfacing. On arrival, he had slight swelling of his lower lip but no other abnormal signs. He was clearly anxious. After discussion, he was recompressed using a USN Treatment Table 6 (USN TT6). There was no apparent change in his symptoms during the treatment but when reviewed the following day, these had resolved completely and he felt well.

CASE 4

A 49-year-old man undertook a 49-min dive to a maximum depth of 38 msw, breathing nitrox27. It was the third dive of his trip. He was aware of LMJ in the water and of tentacles around his regulator. On surfacing he noticed tingling around his lips and had local swelling. Thirty minutes later, he developed tingling of his right big toe, the sole of his left foot, the palmar aspect of his right hand and his left hand. On arrival at the chamber he was anxious but not hyperventilating. Physical examination was unremarkable with no objective sensory loss and no focal neurological abnormalities. In view of persisting symptoms in both hands and feet, he was recompressed using a USN TT6. His symptoms resolved completely during the treatment and he remained asymptomatic on review the following morning.

CASE 5

A 28-year-old marine scientist presented to us two hours after completing a 50-min dive to a maximum depth of 36 msw, breathing nitrox25. She was stung on her face by a jellyfish during descent which she identified as a LMJ. She felt immediate pain around her top lip during the dive which worsened as her dive progressed. On surfacing she was aware of a flitting "*pins and needles*" sensations throughout her whole body. She was treated with 80% O_2 on the dive-boat and self-medicated with a 1 mg betamethasone tablet and topical 1% hydrocortisone cream to her face. At the time of presentation there was visible swelling of her upper lip but no other abnormal clinical signs. Her symptoms had already begun to resolve. She was observed on O_2 for a further hour by which time her systemic symptoms had subsided. No other treatment was necessary.

Discussion

The cases described above are from a large series of more than 550 divers presenting to the Orkney unit over the past 20 years. All of these divers presented with suspected DCI or were perceived at risk of developing DCS after uncontrolled ascents or missed decompression. Three-hundred and sixty-two of these divers had a final diagnosis of DCS of which 130 had symptoms or signs consistent with involvement of the neurological system. More than 80% of these divers developed neurological features within an hour of surfacing, including localised numbness, weakness, girdle pain, paralysis, vestibular dysfunction and urinary retention.

The five cases described in this series are distinct from the DCS cases in a number of features. In all cases, the neurological symptoms were flitting and widespread with pinpoint tingling sensations at multiple sites. Treatment with O2 on the dive-boat did not produce any identifiable change in symptoms. None of the five divers in this series had any obvious precipitating factors for DCS, such as an unusually significant nitrogen load, uncontrolled ascents or missed decompression. None of the cases had presentations or histories suggestive of shunt-related DCS, e.g., skin rashes, vestibular or spinal symptoms, history of migraine with visual aura or previous DCS. The absence of an identifiable precipitating event or predisposition does not exclude DCS, but it does make it less likely. In all five cases, the diver reported contact with jellyfish tentacles in the water. Whilst we cannot be completely confident that all were LMJ, all of the descriptions were consistent and these are the predominant jellyfish with long tentacles in Orkney waters and are commonly found around shot lines. In one case there was a definitive identification, in the other four cases LMJ were reported to have been in the water at the dive site. The presence of local symptoms at the site of contact also point to LMJ as the species implicated, there are no other toxic jellyfish commonly present in Orkney waters (Porter J, personal communication, 2018). It is not possible at present to identify toxin in serum samples but in the event of significant local reaction, skin scrapings or sticky tape tests may aid identification of nematocysts in future cases (Currie B, personal communication, 2018).

Despite the presence of systemic symptoms, none of these five cases were seriously unwell. We did not see features suggestive of the Irukandji syndrome which has been described in envenoming by a variety of carybdeid jellyfish.[13] It appears, however, that although less severe, there may be some shared symptoms of Irukandji-like envenoming from toxins of non-carybdeid jellyfish (Currie B, personal communication, 2018).[7] Two of our patients were recompressed because at the time of presentation it was impossible to definitively exclude DCS. There was an improvement in the symptoms of one of these divers during recompression, which could suggest that DCS was indeed the underlying diagnosis. However, we suspect that what we observed was the natural resolution of symptoms with time rather than a therapeutic effect of recompression (an un-extended USN TT6 lasts 4 hours 40 min). Symptoms in the other four divers in this series resolved within a similar time frame without recompression. It was salutary to observe that case 1 was a diver who normally carried adrenaline for self-treatment of anaphylaxis for a nut allergy. He did not usually carry adrenaline on the dive-boat during dive trips. Anaphylaxis has been described after a second LMJ sting and we advised this diver that in future he should carry his adrenaline with him on the boat. The mechanism of anaphylaxis was first described by using a protein extracted from the tentacles of a Portuguese man of war (*Physalia physalis*).[2]

We believe that these cases exhibited a mild syndrome of systemic envenoming with LMJ toxin and that it is likely that this was the explanation for the symptoms in all five divers. In addition to discomfort and inflammation at the contact site, all five had similar flitting neurological symptoms. It was appropriate that all five divers presented as possible cases of DCS but the symptoms were not typical of the presentations we usually see. It was impossible to definitively exclude DCS in two of these cases and, in similar cases where significant doubt exists, it will always remain safer to treat with recompression than not to do so. Notwithstanding this, where there are no obvious precipitating factors, a definite history of LMJ contact, atypical flitting symptoms and an absence of neurological signs, we believe it is reasonable to observe these patients on oxygen in the first instance rather than recompress them.

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Ethics statement

This was a retrospective case series of divers presenting over more than 10 years. It was not possible to contact some of the earlier cases in the series. Advice was sought from the Director of Public Health and the Caldicott Guardian for the National Health Service – Orkney. Given the time course that had elapsed and the absence of identifiable clinical information, it was considered that there were no significant confidentiality issues which would prevent publication.

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