CASE REPORT

Haemorrhage, hyponatraemia and more than just a hack

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Accepted 28 May 2014

SUMMARY

A 43-year-old previously healthy solicitor presented with a 9-day history of cough productive of yellow sputum with a prodrome of sore throat and myalgia. The cough was paroxysmal in nature and severe enough to cause extensive bilateral subconjunctival haemorrhages and cough syncope multiple times a day, with one bout of associated haematemesis on the day of admission. He was isolated, treated for a presumed atypical chest infection with tazocin and clarithromycin, and monitored carefully until the hyponatraemia on presentation was resolved. Atypical screen and blood cultures were sent off, though unexciting at first, eventually confirmed the unlikely; *Bordetella pertussis*, much to the surprise of many who had *Legionella* as the top differential.

BACKGROUND

Bordetella pertussis commonly known as 'whooping cough' is thought of as a predominantly childhood disease or one that is more prevalent in those who are immunocompromised/unvaccinated. The pathogen is a Gram-negative coccobacillus spread via respiratory droplets during the paroxysms of coughing that it typifies.¹ It is highly contagious and typically has an incubation period of 7–10 days, much longer than the usual 1–3 days of a non-specific viral upper respiratory tract infection,² as a result, it should be a differential high on the list for a subacute cough, especially considering the rising number of cases in recent years.

Figure 1 clearly demonstrates that usually in any year pertussis activity rises in quarter 3 and then declines (part of the year that this case presented). The year 2012 was an unusual year, in that the department of health announced a national outbreak in April.³ Having an awareness of public health and the epidemiology of diseases in the community helps hone differentials in tertiary care, a learning lesson for all professionals.

Only once it is thought of as a differential can further thoughts about isolation, confirmation of diagnosis and treatment ensue. Pertussis has three stages:

1. Catarrhal—lasting 7–10 days
2. Paroxysmal—lasting 1–6 weeks
3. Convalescent—lasting 7–10 days

It is recommended to start treatment before the paroxysmal stage, if at all suspected, to decrease the length of course. This patient presented on day 9 thus was most likely in transition from catarrhal to paroxysmal stage. Patients are only considered non-infectious after completion of 5 days of appropriate antibiotics,³ and considering its nature of

high infectivity it was all but imperative to isolate the patient, which in this case was maintained from admission.

Public Health England (PHE) report regarding laboratory confirmed cases of pertussis between April and June 2013 interestingly showed that 83% of cases confirmed were in the 15+ age group, further proving the need for a high index of suspicion in the adult population. Additionally, of this cohort, 97% were confirmed by serology and a mere 3% by culture.³ To come to the right diagnosis it is useful to know which microbiological tests are most likely to capture the diagnosis.

Generally in a non-outbreak setting, the tests used for diagnosis depend on the duration of the cough:

- ▶ 0–2 weeks—culture and PCR, sensitivity of culture highest during this period;
- ▶ 2–4 weeks—culture (though not very sensitive after 2 weeks)/serology and PCR—PCR alone is not sufficient for diagnosis;
- ▶ >4 weeks—only serology.⁴

Although culture remains the standard for diagnosis and has an excellent specificity, sensitivity is said to be as low as 30–60%,⁵ many reasons of which include, recent antibiotic use, prolonged transport time to the laboratory and thus delayed specimen plating. Optimal results for a culture are immediate plating of the nasopharyngeal swab, this of course in practice rarely ever happens. Additionally, the usual cotton or rayon swabs should strictly not be used as they contain fatty acids that are toxic to the coccobacillus, instead calcium alginate or dacron swabs, the latter especially proficient for culture and PCR should be used. Cultures take 7–10 days.⁴

PCR has the advantage of detecting viable and non-viable organisms, thus increasing sensitivity. Additionally, results are available in a few days and not influenced by previous antibiotic use, however, the price being monetarily expensive often means, it is not available.⁴

Serology is used in the later stages; two ways are useful for diagnosis, one involves comparing the acute phase titres to the convalescent phase titres, typically involving a fourfold increase,⁴ or a single sample titre above a designated threshold (in England this equates to PT IgG >70 IU/mL) providing an absence of immunisation within the past year.⁶ In this case, in keeping with the majority filed to the PHE, cultures were negative, however serology was positive, this may have been because of the decreased sensitivity post 2 weeks of onset of symptoms.

To cite: Shah M, Kandil H. *BMJ Case Rep* Published online: [please include Day Month Year] doi:10.1136/bcr-2014-203562

Figure 1 Total number of laboratory-confirmed pertussis cases per quarter in England, 2005–2013. Crown copyright. Reproduced with permission of Public Health England.³

While the above helped to arrive at an informed diagnosis, it is evident that the results may not be present for days to come, thus isolation as aforementioned is key with initiation of empirical antibiotics; a macrolide clarithromycin/azithromycin for 5 days is recommended.⁷

Once diagnosis is confirmed—PHE have to be notified so contact tracing can begin.

In this case in particular, the red herring of hyponatraemia led professionals towards the diagnosis of *Legionella*, this luckily did not interfere with the initiation of the right antibiotics or keeping the patient in isolation. It is important to note however that there were typical signs of pertussis with the paroxysmal cough, inspiratory whoop and post-tussive emesis (albeit only one episode).

CASE PRESENTATION

A 43-year-old man presented to the general practitioner (GP) with a 9-day history of cough preceded by general malaise and sore throat and reports of an increasing frequency of syncopes. Syncopes were anything up to 4–5 times a day lasting only a few seconds with no presyncopal features, though he felt intermittently lightheaded, this was not associated with the syncopes, and was sometimes preceded by a coughing fit. Associated with the overbearing cough there was a lack of appetite, hoarse voice

and subconjunctival haemorrhages noted on the medial right and left eye. By this point he was already on amoxicillin as advised by the GP.

A further visit to the GP revealed hypotension, no postural drop and nothing to note on clinical examination, however the increased frequency of syncopes led to an A&E department referral. On the way to A&E department, the patient suffered from several bouts of vomiting, bilious in nature until he was transferred to ward where he had one episode of haematemesis. At admission a 'syncope' was witnessed; a coughing fit where the patient went red in the face, had a tonic-clonic fit-like episode lasting 5 s followed by a full regain in consciousness, no postictal period noted.

The patient is a non-smoker with no known allergies, living in a house with no pets, has no history of foreign travel except for visiting Ireland in the recent past, and is a drinker of 14–18 units/week. He works in an open plan office with no one at home or work unwell according to his knowledge.

INVESTIGATIONS

Initial bloods of interest showed: haemoglobin 139 g/dL, white cell count $8.9 \times 10^9/L$ and C reactive protein 21 mg/L, however interestingly a hyponatraemia of 113. Blood cultures were sent

Figure 2 Normal chest X-ray from first day of admission.

Figure 3 Chest X-ray from third day of admission showing left basal consolidation.

Figure 4 The patient's extensive bilateral subconjunctival and periorbital soft tissue haemorrhages.

which came back negative, equally ECG was normal. A chest X-ray initially (figure 2) showed no evidence of focal consolidation; this was then repeated on day 4 of admission which then showed left basal consolidation (figure 3).

Atypical pneumonia screen was sent for *Legionella*, pneumococcal, respiratory syncytial virus and influenza and sputum for microbiology culture and sensitivity, all of which came back negative. The hyponatraemia was investigated to exclude other causes such as syndrome of inappropriate secretion of antidiuretic hormone (SIADH), however serum osmolality of 239 mOsmol/kg and urine osmolality 915 mOsmol/kg with urinary Na 62 compared with the serum Na 113 excluded this on the day of presentation, however supporting somewhat the idea of hypovolaemic hyponatraemia from previous emesis. Additionally, a normal thyroid function (thyroid-stimulating hormone 1.08 mIU/L, T4 14.7 pmol/L) and a normal random cortisol (554 nmol/L) excluded the other common pathologies of adrenocorticoid deficiency and hypothyroidism.

DIFFERENTIAL DIAGNOSIS

Atypical pneumonia differentials included pertussis, *Legionella* and a viral pneumonia. The hyponatraemia meant the chest consultant in charge having performed literature searches was convinced the diagnosis would be an atypical form of *Legionella*. The microbiology consultant however was in favour of pertussis having noted the paroxysmal nature of the cough, cough syncope and episodes of post-tussive emesis, thus serology for pertussis was requested.

Figure 5 The patient's extensive bilateral subconjunctival and periorbital soft tissue haemorrhages.

Figure 6 The patient's extensive bilateral subconjunctival and periorbital soft tissue haemorrhages.

TREATMENT

The patient was treated with intravenous tazocin for 5 days and 14 days of clarithromycin, prednisolone (5 days) and nebulisers while an inpatient.

OUTCOME AND FOLLOW-UP

It was noted that the cough during the next 2 days had developed a 'whoop' component to it, and the bilateral subconjunctival haemorrhages (figures 4–7) had gotten considerably worse with some subcutaneous haemorrhages into the periorbital tissue with some mild oedema, not associated with any compromise in vision.

Another presyncopal episode noted a small amount of stridor, thus ear, nose and throat specialists were called to perform a scope to eliminate any supraglottic stenosis, which there was no evidence of.

Oramorph was started to provide some relief from coughing.

The hyponatraemia resolved over 5 days and syncope resolved on day of admission. With negative results to the atypical pneumonia screen a CT of the chest was conducted which showed nothing more than the left basal atelectasis (figure 8). With no resolve in gaining a diagnosis further serology for *Coxiella*, Q fever, *Mycoplasma* and *B. pertussis* were sent.

B. pertussis was confirmed on serology a week after admission, the patient received 5 days worth of intravenous tazocin and sent home with clarithromycin to complete a 14-day course. PHE informed with contact tracing required.

Figure 7 The patient's extensive bilateral subconjunctival and periorbital soft tissue haemorrhages.

Figure 8 Section of CT showing left basal atelectasis.

The patient was followed up in the acute chest clinic the week after discharge, the haemorrhages were resolving very gradually.

DISCUSSION

B pertussis is most commonly known as a childhood disease, it should however be thought of in adults with a cough lasting for

more than 2 weeks. The complication and indeed, a red herring in this case, of hyponatraemia has been mentioned in childhood cases secondary to SIADH,⁸ related to neonatal oedema⁹ or related to cerebral haemorrhages, disseminated intravascular coagulation and concomitant pseudomonas infection.¹⁰

It seems that when *B. pertussis* is isolated in adult patients it can be with atypical signs such as florid subconjunctival haemorrhages and hyponatraemia as this one, but can also progress to encephalopathy.¹¹

Learning points

- ▶ This case highlights that it is important to avoid being side tracked by one clinical indicator (hyponatraemia in this case).
- ▶ Knowledge of community communicable diseases helps raise awareness of atypical differentials in tertiary care.
- ▶ An understanding of which microbial tests should be performed when, giving optimal chance of clinching the diagnosis.
- ▶ High index of suspicion of cough in the adult population especially lasting more than 2 weeks should encourage empirical treatment for pertussis and isolation.
- ▶ Importance of implementing good infection control practice by isolating patients while investigating.

Patient's perspective

Thinking back, I think that the process of referring me to hospital was very efficient. I am habitually very slow to consult a doctor and nearly 2 weeks of heavy coughing passed before I made my first appointment. Prior to my first consultation I don't think I had experienced any loss of consciousness while coughing and I was sent home by the GP with some antibiotics and an inhaler. I returned within a day or so after I lost consciousness during a bout of coughing while I was talking to my builder. I was given an appointment on the same day and the GP immediately diagnosed cough syncope and referred me to the hospital.

Shortly after arriving at the hospital, I (fortunately or unfortunately) experienced my one and only bout of vomiting which got me some fairly prompt attention. I was admitted in pretty short order and put in an isolation unit. Strangely, for the first 2 or 3 days the staff didn't wear masks in my presence—and then 1 day they suddenly did. I remember the chest consultant explaining the change very smoothly saying that the masks were merely a precaution and that their previous omission was an oversight. Nevertheless, I did experience a mild tremor of anxiety which could probably have been avoided if the masks had been worn from the start.

I was slightly surprised by the delay in making a final diagnosis after my arrival at the hospital—especially after the cough syncope had been clearly established (and indeed witnessed by some of the staff). I do remember the chest consultant saying very early on that he suspected whooping cough, but that he had no evidence and, indeed some data (the low salt levels) which seemed to point elsewhere. I don't have a very precise recollection of the sequence of events or of what I was told and when, but I do remember thinking that the data I

had been given about what tests would be conducted and when the results would be received were quite vague. I also had a sense that my expectations in this respect were being reset fairly regularly. I was surprised at the length of time that elapsed between being advised that a nasal swab would be carried out and the time it was actually done—and I later picked up that the initial sample I had given had gone missing after that (although by then I was beginning to feel better and I don't remember feeling anything other than mild frustration at the news).

The delay in reaching a diagnosis did ultimately have a significant impact on my experience—I was at times very frightened (more frightened than I gave out) and the uncertainty about my condition and its likely trajectory was an important part of this. I am not particularly afraid of pain—and I wouldn't describe any of what I went through as particularly painful—but losing consciousness four or five times a day was very scary, particularly when nobody knew for certain what was going on. At times I did feel a bit like one of Dr House's patients waiting to be diagnosed and brought back from the brink. I think that if someone had been able to tell me clearly that I had the whooping cough, that the experiences I was experiencing were, though unpleasant, a known quantity and that I would ultimately be alright, I think I would have been able to face the whole thing with a lot more equanimity.

That apart, I should say that I was very satisfied with my experience at the hospital. All of the staff seemed very confident and competent and the doctors (of whom I must have seen about a dozen), in particular, had a very good bedside manner. At all times, I had a clear sense that they were doing everything they could to make me better (and comfortable in the meantime).

Contributors MS wrote the first draft of the manuscript and rewrote new drafts based on inputs from the coauthor. HK gave input on manuscript drafts, corrected and advised amendments.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

- 1 Warfel JM, Baren J, Merkel TJ. Airborne transmission of *Bordetella pertussis*. *J Infect Dis* 2012;206:902–6.
- 2 Cornia P, Lipsky B. Microbiology, epidemiology, and pathogenesis of *Bordetella pertussis* infection. Uptodate.com 2013 (accessed 15 Nov 2013).
- 3 Public Health England. Laboratory confirmed cases of pertussis reported to the enhanced pertussis surveillance programme: April to June 2013. Health Protection Agency, Vol 7 number 34. 23 August 2013. (accessed 24 Nov 2013).
- 4 Cornia P, Lipsky B. Clinical manifestations and diagnosis of *Bordetella pertussis* infections in adolescents and adults. Uptodate.com 2013 (accessed 15 Nov 2013).
- 5 Young S, Anderson G, Mitchell P. Laboratory observations during an outbreak of pertussis. *Clin Microbiol News* 1987;9:176.
- 6 Public Health England. Pertussis fact sheet for healthcare professionals. August 2013. http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1317139762805 (accessed on 2 Jan 2013).
- 7 Cornia P, Lipsky B. Treatment and prevention of *Bordetella pertussis* infection in adolescents and adults. Uptodate.com 2013 (accessed 15 Nov 2013).
- 8 Matherne P, Matson J, Marks MI. Pertussis complicated by the syndrome of inappropriate antidiuretic hormone secretion. Pathophysiology and management. *Clin Pediatr* 1986;25:46–8.
- 9 Jansen CM, Miedema C. Edema as a new predominant symptom of *Bordetella pertussis* infection in a newborn. *Eur J Pediatr* 2009;168:1543–5.
- 10 Immunization action coalition. Unprotected people #47: 'Pertussis deaths—United States, 2000'. <http://www.immunize.org/reports/report047.asp> (accessed on 1 Nov 2013).
- 11 Halperin SA, Marrie TJ. Pertussis encephalopathy in an adult: case report and review. *Rev Infect Dis* 1991;13:1043–7.

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