CASE REPORT

Necrotising fasciitis as a complication of primary varicella infection in an immunocompetent child

Karthik Darmasseelane, Teresa Banks, Tatiana Rjabova

Department of Paediatrics, Royal
United Hospitals Bath NHS
Foundation Trust, Bath, UK

Correspondence to
Dr Karthik Darmasseelane,
kd508@doctors.net.uk

Accepted 18 May 2018

SUMMARY

Necrotising fasciitis (NF) is an infrequent yet significant complication of primary varicella infection in immunocompetent children. We report a case of a 4-year-old girl who presented three days into her chicken pox illness, with a rapidly progressing, severely tender erythematous rash surrounding one chicken pox lesion on her thigh. She required intravenous antibiotics, two surgical debridements, a skin graft and a prolonged stay in the paediatric intensive care unit, but ultimately we were able to save her life and limb. NF is a rare complication of chicken pox that has high morbidity and mortality that requires prompt and specific treatment.

BACKGROUND

Chicken pox is a very common childhood illness, caused by the varicella zoster virus (VZV), and is often considered as benign by both the general public and by medical professionals. Infections in pregnant women, immunocompromised patients or within the neonatal period are typically associated

with high morbidity and mortality, but VZV infection is generally thought to be a self-limiting condition in an otherwise healthy child. Most cases are managed symptomatically in the community. This case exemplifies a life-threatening complication in an immunocompetent child and highlights the need for prompt and appropriate management and treatment which in this case, ultimately saved this girl's limb and life.

CASE PRESENTATION

A 4-year-old girl, otherwise fit and healthy, presented to the emergency department three days after developing chicken pox, reporting a 24-hour history of pyrexia and spreading erythema surrounding one chicken pox lesion. She had received two doses of ibuprofen for symptomatic management in the community, prior to presentation.

On arrival, she was pyrexial and tachycardic. A one-inch area of tender erythema surrounded the chicken pox lesion on her right thigh; the centre of which looked black and scabbed. Blood cultures were taken and flucloxacillin was commenced for suspected cellulitis, prior to transfer to the paediatric ward.

Over the following hours the rash continued to spread and the pain became more severe. The patient would not let her blanket rest over her thigh or let any member of staff touch it and required morphine for pain control. Given her degree of pain and spreading erythema, necrotising fasciitis (NF) was raised as an important differential. The antibiotic regime was changed to intravenous piperacillin with tazobactam, clindamycin and gentamicin, and she was reviewed by the surgical and intensive care teams.

Despite antibiotic treatment, the erythema continued to spread and the skin around the lesion started to develop a bluish discolouration (figure 1). She was transferred to the local tertiary plastics unit where she was immediately taken to theatre for extensive surgical debridement, confirming the diagnosis of NF (figure 2).

INVESTIGATIONS

Initial preantibiotic blood cultures: negative after 5 days

Initial booking C-reactive protein (CRP): 40

Highest lactate prior to surgery: 2.1

Tissue debridement cultures: beta-haemolytic *Streptococcus* group A from direct and enrichment cultures. *Staphylococcus* species isolated from

Figure 1 Preoperative photo of the lesion on the thigh.

To cite: Darmasseelane K, Banks T, Rjabova T. *BMJ Case Rep* Published Online First: [please include Day Month Year]. doi:10.1136/bcr-2018-225018

Figure 2 Intraoperative photo demonstrating degree of debridement.

enrichment culture only. Gram-negative cocci were seen but not cultured.

OUTCOME AND FOLLOW-UP

Following the acute intervention, she required one further debridement and a skin graft ([figure 3](#)). After a period of time in intensive care requiring intravenous antibiotics, negative pressure wound therapy and analgesia, the patient recovered well. Following the isolation of group A *Streptococcus* and *Staphylococcus* species, the antibiotics were rationalised to once a day intravenous high-dose ceftriaxone. This allowed completion of a prolonged course of intravenous antibiotics at home and facilitated discharge from hospital. Since completion of therapy, she has made a full recovery and has full function of her right leg, though still has some degree of residual scarring ([figure 4](#)).

DISCUSSION

More than 90% of primary varicella infections are estimated to occur within the first 15 years of life,¹ though hospitalisation secondary to varicella is only estimated at 7.6 per 100 000 in the UK.² Over half the cases of chicken pox-related hospitalisations have been shown to be due to a superinfection, commonly cellulitis or abscess formation (estimated at over 30%). Rarer complications include neurological sequelae (8%) or pulmonary complications including pneumonitis and acute respiratory distress syndrome (3.1%).³ Of all hospitalisations due to

Figure 3 Photo following skin graft.

Figure 4 Recent photo demonstrating degree of residual scarring.

primary varicella infection in children, it is estimated that <1% are attributable to NF.³

NF is a rare and rapidly progressing infection of the superficial fascia and subcutaneous tissues that carries a significant mortality rate requiring urgent and specific treatment. It is caused by a bacterial infection tracking along the fascial layer, through a breach in the skin. More than one pathogen is often isolated from either blood or tissue cultures, and it is thought this combination of bacteria leads to the rapid progression of the condition. Varicella infection has been reported to be the most common initiating factor in children diagnosed with NF.⁴ Mortality associated with NF is estimated at around 20%, though some studies report mortality as high as 60% (>80% in the neonatal period).^{4–8} Immunosuppression, hypothermia, hypotension and shock have been shown to be statistically significant predictors of mortality in children with NF.⁴

In addition to the significant risk of mortality, NF carries a substantial burden of morbidity. It is estimated that 78%–91% of children who survive NF have significant long-term sequelae, including scarring ([figure 4](#)), functional joint limitations and amputations.^{4,7} Studies to date have not formally explored the long-term psychological trauma of the event on both the patient and the family members, though it is thought to be a significant cause of morbidity.

Group A *Streptococcus* is the most commonly isolated organism in NF. There is increasing literature globally to suggest an increase in invasive group A streptococcal disease, though the cause of this is not yet known. Cytokine release in response to bacterial proteins and exotoxins is thought to be responsible for the high morbidity and mortality seen, and effective treatment is required to prevent negative outcomes.⁵ Despite an increase in severity and frequency of the disease, high-dose penicillin remains the treatment of choice and has been shown to be highly effective. Of note, there has been no reported evidence of penicillin resistance in these organisms.⁵

Diagnosis of NF is difficult in children, as cases usually occur in previously healthy individuals; studies suggest >90% of cases of NF occur in children without a pre-existing immunodeficiency.⁹

Furthermore, clinical signs and symptoms are difficult to elicit in a paediatric population, often contributing to a delay in diagnosis.

If a diagnosis of NF is suspected, high-dose combined antibiotic cover should be started: clindamycin, penicillin and an aminoglycoside. Clindamycin should specifically be prescribed as it is a potent suppressor of both toxin synthesis and tumour necrosis factor- α , and has also been shown to have synergistic actions with penicillin.^{10 11} Urgent review by a surgical team is essential, followed by prompt transfer to a unit that is able to take the child to theatre for exploratory surgery for confirmation of diagnosis and subsequent debridement (source control). There is also some reported benefit of using IV immunoglobulin and hyperbaric oxygen.⁴ If recognised promptly and treated appropriately, NF has an good prognosis.

Use of non-steroidal anti-inflammatory drugs (NSAIDs) in children with primary varicella has been associated with developing NF. In a case control study, Zerr *et al*¹² demonstrated increased ibuprofen use prior to hospitalisation in children with NF compared with children with non-NF soft tissue infections. However, subsequent studies have found no associations.¹³ It is unclear the role that ibuprofen played in this particular case, but current NICE guidelines suggest avoiding NSAID use in children with chicken pox.¹⁴

There is ongoing global debate about the introduction of a varicella vaccine into the universal vaccination programme. At present, the UK does not offer varicella vaccination routinely to children¹⁵ due to concerns over risk of more severe herpes zoster infections in later life. Due to difficulties in studying zoster infections, evidence for this is limited. Long-term follow-up studies have demonstrated no increased risk of shingles in a vaccinated population, though median age of population at follow-up was <50.¹⁶ Since the introduction of universal varicella vaccination in USA, paediatric hospitalisations secondary to varicella have decreased by 88%.¹⁷ Vaccinating an elderly population against shingles has been shown to be highly effective,¹⁸ and therefore it has been suggested that vaccinating both children and an elderly population would significantly reduce the burden of varicella disease in both age groups.

NF is a rare but important complication of varicella infection, requiring prompt and specific treatment to spare life and limb.

Learning points

- Chicken pox is a very common childhood illness but can have serious and potentially life-threatening and life-changing complications.
- Children are often miserable with illness, but pain and irritability out of proportion should always raise suspicion of necrotising fasciitis.
- Ibuprofen should be used cautiously or avoided in children with chicken pox.

Interestingly of note in this case, despite having extensive and invasive disease, in a child who looked toxic, pathology results did not reflect a severe inflammatory response (with a CRP of 40, lactate of 2.1 and negative blood cultures). This emphasises, especially in paediatrics, that we must treat the patient, not the numbers.

Contributors All authors contributed to interim drafts of the paper, and reviewed and approved the final manuscript. KD, TB and TR were all involved with the clinical management of the patient.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent Parental/guardian consent obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

© BMJ Publishing Group Ltd (unless otherwise stated in the text of the article) 2018. All rights reserved. No commercial use is permitted unless otherwise expressly granted.

REFERENCES

- 1 Brisson M, Edmunds WJ, Law B, *et al*. Epidemiology of varicella zoster virus infection in Canada and the United Kingdom-CORRIGENDUM. *Epidemiol Infect* 2015;143:1332.
- 2 Hobbelen PH, Stowe J, Amirthalingam G, *et al*. The burden of hospitalisation for varicella and herpes zoster in England from 2004 to 2013. *J Infect* 2016;73:241–53.
- 3 Grimpel E, Levy C, de La Rocque F, *et al*. Paediatric varicella hospitalisations in France: a nationwide survey. *Clin Microbiol Infect* 2007;13:546–9.
- 4 Fustes-Morales A, Gutierrez-Castrellon P, Duran-Mckinster C, *et al*. Necrotizing fasciitis: report of 39 pediatric cases. *Arch Dermatol* 2002;138:893–9.
- 5 Leitch HA, Palepu A, Fernandes CM. Necrotizing fasciitis secondary to group A streptococcus. Morbidity and mortality still high. *Can Fam Physician* 2000;46:1460–6.
- 6 Collette CJ, Southerland D, Corral CJ. Necrotizing fasciitis associated with haemophilus influenzae type b. *Am J Dis Child* 1987;141:1146.
- 7 Eneli I, Davies HD. Epidemiology and outcome of necrotizing fasciitis in children: an active surveillance study of the Canadian paediatric surveillance program. *J Pediatr* 2007;151:79–84.
- 8 Lally KP, Atkinson JB, Woolley MM, *et al*. Necrotizing fasciitis. A serious sequela of omphalitis in the newborn. *Ann Surg* 1984;199:101–3.
- 9 Moss RL, Mussemche CA, Kosloske AM. Necrotizing fasciitis in children: prompt recognition and aggressive therapy improve survival. *J Pediatr Surg* 1996;31:1142–6.
- 10 Smieja M. Current indications for the use of clindamycin: a critical review. *Can J Infect Dis* 1998;9:22–8.
- 11 Gemmell CG, Peterson PK, Schmeling D, *et al*. Potentiation of opsonization and phagocytosis of streptococcus pyogenes following growth in the presence of clindamycin. *J Clin Invest* 1981;67:1249–56.
- 12 Zerr DM, Alexander ER, Duchin JS, *et al*. A case-control study of necrotizing fasciitis during primary varicella. *Pediatrics* 1999;103:783–90.
- 13 Lesko SM, O'Brien KL, Schwartz B, *et al*. Invasive group A streptococcal infection and nonsteroidal antiinflammatory drug use among children with primary varicella. *Pediatrics* 2001;107:1108–15.
- 14 Cks.nice.org.uk. Chickenpox-NICE CKS. 2018. <https://cks.nice.org.uk/chickenpox#!topicsummary> (accessed 1 Feb 2018).
- 15 Nhs.uk. Vaccinations-NHS.UK. 2018. <https://www.nhs.uk/conditions/vaccinations/pages/vaccination-schedule-age-checklist.aspx> (accessed 1 Feb 2018).
- 16 Hambleton S, Steinberg SP, Larussa PS, *et al*. Risk of herpes zoster in adults immunized with varicella vaccine. *J Infect Dis* 2008;197(s2):S196–9.
- 17 Zhou F, Harpaz R, Jumaan AO, *et al*. Impact of varicella vaccination on health care utilization. *JAMA* 2005;294:797.
- 18 Oxman MN, Levin MJ, Johnson GR, *et al*. A vaccine to prevent herpes zoster and postherpetic neuralgia in older adults. *N Engl J Med* 2005;352:2271–84.

Copyright 2018 BMJ Publishing Group. All rights reserved. For permission to reuse any of this content visit <http://group.bmj.com/group/rights-licensing/permissions>.
BMJ Case Report Fellows may re-use this article for personal use and teaching without any further permission.

Become a Fellow of BMJ Case Reports today and you can:

- ▶ Submit as many cases as you like
- ▶ Enjoy fast sympathetic peer review and rapid publication of accepted articles
- ▶ Access all the published articles
- ▶ Re-use any of the published material for personal use and teaching without further permission

For information on Institutional Fellowships contact consortiasales@bmjgroup.com

Visit casereports.bmj.com for more articles like this and to become a Fellow