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CASE REPORT

Noma (Cancrum Oris): A Report of a Case in a Young AIDS Patient with a Review of the Pathogenesis

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Abstract Noma (cancrum oris) is a mutilating necrotising disease of the orofacial tissues. It affects predominantly debilitated malnourished children, in whom the necrotic process may cause severe damage to mid-facial structures. Its aetiopathogenesis is uncertain, but its course is fulminating, and without timely intervention the disease may be fatal. Antibiotic treatment during any stage of necrotising stomatitis and of its sequel noma can stop progression of the disease; therefore detection and treatment of early intraoral necrotising lesions whether necrotising gingivitis, necrotising periodontitis or necrotising stomatitis are critical in preventing noma. We present an extreme case of noma in a malnourished HIV-seropositive child. There was an acute necrotic process affecting both the maxilla and the mandible with denudation of bone, spontaneous exfoliation of teeth, necrotising fasciitis and myonecrosis which destroyed the lips and cheeks and extended to the infra-orbital margins. There was severe disfigurement and severe impairment of function. Noma is primarily an anaerobic bacterial infection with secondary ischaemia leading to osteonecrosis and mid-facial destruction.

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Introduction

Noma (cancrum oris) is a disfiguring necrotising disease affecting the face predominantly of malnourished children. The peak of incidence is between 1 and 4 years of age; it is unusual in children outside this age range; and adults are rarely affected [1–3]. The necrotic process starts in the mouth, spreads intra-orally with destruction of soft tissues and bone, and it may then perforate the facial skin causing disfigurement [1–13]. The global incidence is quite high at 140,000 new cases per year [6, 13].

The aetiopathogenesis of noma is unknown, but it appears that interactions of several factors, including infectious agents (bacterial and viral), malnutrition and immune suppression are essential for its development [1–13]. Untreated, the condition may be fatal, and survivors suffer facial mutilation that requires major surgical reconstruction [1–13]. Noma is not contagious [7], and it is not recurrent [4, 10].

We present an extreme case of noma in an untreated HIV-seropositive, malnourished child. This case emphasizes the need for greater understanding of the pathogenesis of the disease and for earlier, or preferably preventive treatment.

Case Report

A 6-year-old malnourished HIV-seropositive boy who was not receiving highly active antiretroviral therapy (HAART) was referred to the Polokwane Hospital in Limpopo with a destructive mid-facial lesion. The problem was self-evident

(Fig. 1). The patient's HIV-seropositive mother reported that the child's HIV-seropositive status had been diagnosed 2 years previously. Two weeks before our consultation, a small 'boil' had developed on his upper lip, become ulcerated and then rapidly enlarged with destruction of his facial tissues. During the preceding 2 weeks the child had diarrhoea and had lost his appetite. According to the mother, there were no lesions inside the mouth before the boil on the upper lip had appeared.

On admission to hospital the child was debilitated, underweight and anemic. His CD4+ T cell count was 6 cells/mm^3, but he did not have any clinically evident systemic infective diseases. Microscopic examination of a biopsy specimen showed extensive necrosis of all the tissue elements and mixed inflammatory cell infiltrate in the immediately viable tissue, supporting the clinical diagnosis of noma.

Fluids, electrolytes and antibiotics (amoxicillin/clavulanic acid) were given intravenously; high protein diet and daily irrigation of the facial lesion with saline were started, sloughed tissue was removed (Fig. 2) and the wound was covered with a surgical dressing. HAART was started, and within 4 weeks the patient's general condition had improved. Under general anaesthetic the necrotic bone was resected. The healing was uneventful, and 3 months after the surgery, the child was feeling well and was able to eat by himself (Fig. 3). Computed tomography (CT) 3 months after the resective surgery show the extent of the hard tissue deformity (Fig. 4). His CD4+ T cell count increased to 59 cells/mm^3.

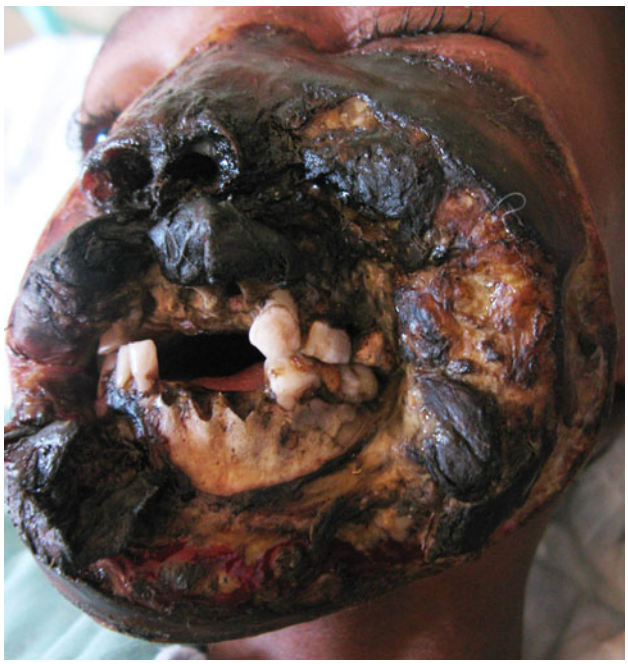

Fig. 1 Severe destruction of the nose, lips, cheeks extending to the infra-orbital margin, and of the anterior mandible and anterior maxilla

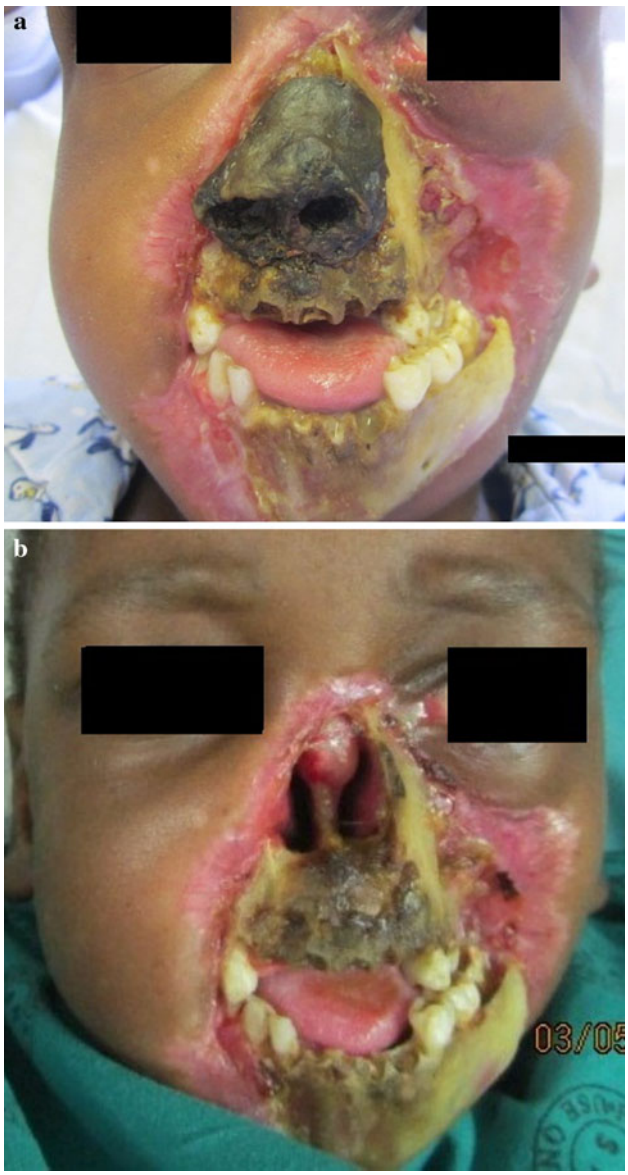

Fig. 2 The appearance 2 weeks after the child was admitted: the sloughed soft tissues have been removed excepting the nasal slough (**a**); all the sloughed soft tissue had been removed (**b**)

Discussion

Noma is a necrotising disease causing destruction of orofacial tissues. In the literature, this necrosis is described as a gangrenous process [1–9, 12, 13]. However, as the distribution of necrosis in noma does not follow the blood supply to the affected tissues [4], and as there are evidently no factors that could induce ischaemic necrosis, it is unlikely that the ischaemic necrosis characteristic to gangrene is the primary pathogenic event.

The critical role of bacteria in the pathogenesis of noma is evident from the foetid odour that characterises even the initial acute stage of the disease, and from the fact that the

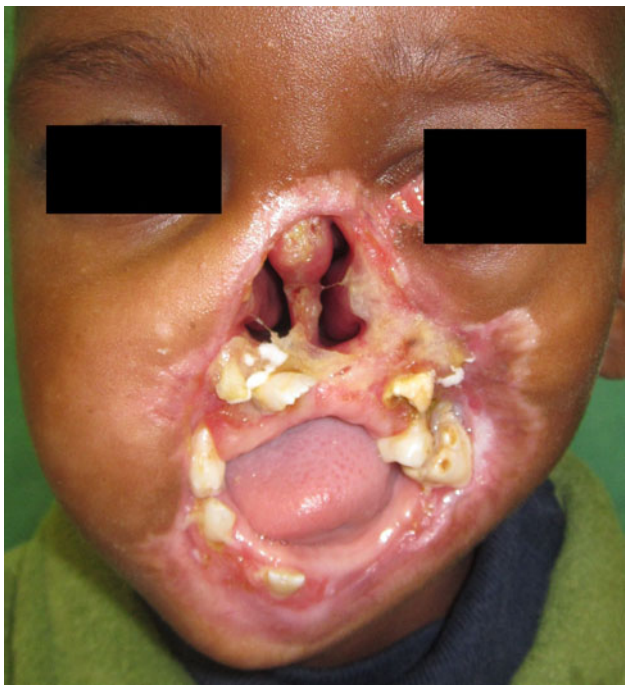

Fig. 3 The appearance of the face 3 months after resection of the necrotic bone. There is extensive scarring around the facial defect

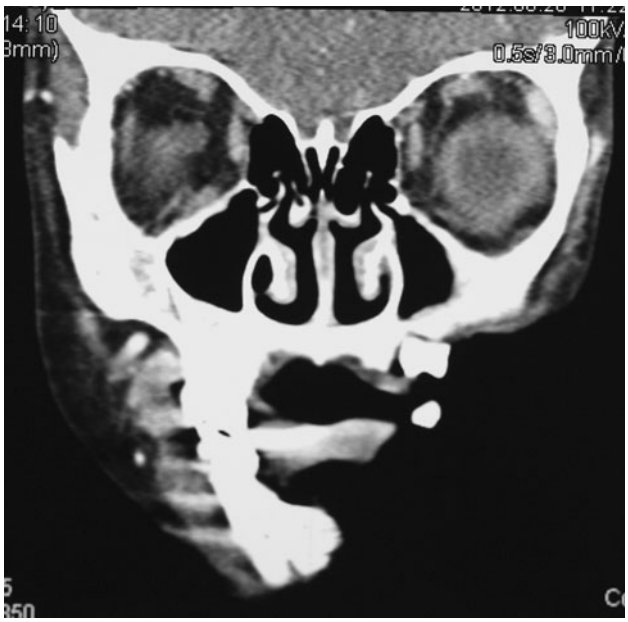

Fig. 4 CT image showing extent of loss of the mandible and maxilla

disease responds to antibiotic treatment [1–9, 12, 13]. *Prevotella melaninogenica, Actinomyces pyogenes, Fusobacterium nucleatum, Bacteroides fragilis, Bacillus cereus, Prevotella intermedia, Fusobacterium necrophorum* and members of the *Peptostreptococcus* genus, are reportedly present in noma. However, as these bacteria are often present in substantial numbers in the mouths of healthy persons, and as some of them have been recovered in significant numbers mainly from advanced as opposed to early lesions of noma, it is probable that while a minority of these microorganisms are the primary infective agents, the rest represent merely superimposed infection [1–4, 7, 9, 12].

Sequential microbiological studies of noma have been hampered by the rapidity with which necrosis and secondary infection set in, and by the difficulties encountered both in culturing anaerobic species and in reproducing the disease experimentally in laboratory animals, so there is as yet no proven association between specific bacterial infections and noma [4, 7].

Molecular phylogenetic techniques have been used to identify the bacteria present in advanced noma lesions of four Nigerian children [9]. Sixty seven bacterial species or phylotypes were detected: contrary to expectation, spirochaetes and fusobacteria were observed only in relatively small numbers.

It is accepted that in noma several bacterial species operate in concert [7, 13] releasing biological mediators that disrupt the local vasculature and degrade extracellular proteins [3, 10]. Subsequently bacterial cellulitis occurs that can be distinguished from the cellulitis caused by pyogenic cocci by the foul odour, by the thin discoloured exudate rather than pus and by the relatively rapid and widespread tissue destruction. Bacterial fermentation with gas formation is not a feature of noma, differentiating it from *Clostridium perfringens*-induced gangrenous necrosis. Necrosis of muscle tissues in the infected field occurs within 1–3 days as the infection spreads, and the necrotic muscle becomes soft, friable, semi-fluid and blue-black in colour owing to the massive proteolytic action of the released bacterial enzymes [10, 12].

However, as noma is characterized by infective myonecrosis, necrotising fasciitis, haemolysis, and marked vascular damage and thrombosis, the ischemic necrosis is a secondary event which adds to the necrotic process. The necrotic bone denuded of its necrotic soft tissue has a smooth surface; and there is spontaneous loss of teeth [10, 14].

Necrotising gingivitis (NG) which is a bacterial infection characterized by gingival necrosis, bleeding and pain, is presumed to be the precursor of noma [2, 12]. Untreated, NG may progress to necrotising periodontitis (NP) which is an extension of NG into the periodontal attachment apparatus [15, 16]. In turn, untreated, NG/NP may spread beyond the mucogingival junction to affect the alveolar, buccal, labial, lingual or palatal mucosa, resulting in necrotising stomatitis (NS). However, NS may sometimes develop without being preceded by NG/NP [17].

Untreated, NS may progress to noma which is characterised by the development of a well demarcated round necrotic perforation of the cheek or lip [10]. During this acute phase of noma the patient is ill, anaemic, apathetic,

and dehydrated [10]. There are few reported cases of noma developing without being preceded by intraoral necrotising lesions [2, 10]. Presumably in these cases the primary infection has been in skin of cheeks or the lips.

It has been suggested [4, 7, 13] that noma is primarily a polybacterial anaerobic infection which occurs in the presence of several predisposing factors, including first and foremost malnutrition, and systemic viral diseases (measles, chickenpox). If not adequately treated, patients with noma will die, usually owing to secondary infection, septicaemia, severe dehydration and malnutrition and rarely haemorrhage [2, 10]. The pathogenesis and the course of noma are outlined in Fig. 5.

Assuming that noma frequently starts as NG/NP, the treatment regimen for this precursor disease must include antibiotic treatment appropriate to anaerobic infection, frequent mouthwashing and gentle tooth cleaning to remove and aerate the necrotic anaerobic pabulum. This will arrest the disease and prevent its possible progression to NS [18–20].

Once NS has developed, antibiotic treatment, frequent irrigation of the lesions, electrolytes and fluids, and if necessary nutritional supplements, will prevent osteonecrosis, myonecrosis, and perforation of the skin [4, 6, 21]. However, depending on the extent of the intra-oral damage, debridement of necrotic bone, extraction of mobile teeth and dental rehabilitation may be required [15].

Once the necrotic process has perforated the skin, antibiotic treatment, irrigation of the lesion, excision of the slough and frequent dressing, and general supportive treatment can limit the damage and prevent fatality [4]. Bony sequestra and loose teeth should be removed [21]. If the patient survives the acute phase of noma then scar tissue around the perforation and fibrosis of the surrounding muscles will severely impair oral function and complex reconstructive surgery will be necessary [10].

Noma occurs almost exclusively in children [6], yet NG/NP/NS are uncommon in this age group in South Africa, even in HIV-seropositive immunosuppressed children [18–20]. In contrast, in Nigeria, NG affects mainly HIV-seronegative children [2]; and fewer than 5 % of Nigerian children who develop noma, are HIV-seropositive [21]. HIV-infection, therefore, appears not to constitute a major risk factor in the pathogenesis of noma in children in Nigeria [2] or in South Africa.

The most important risk factor for noma is malnutrition [1, 5]. In a series of 250 cases of noma in Nigeria, the majority being in children it was found that 49 % were

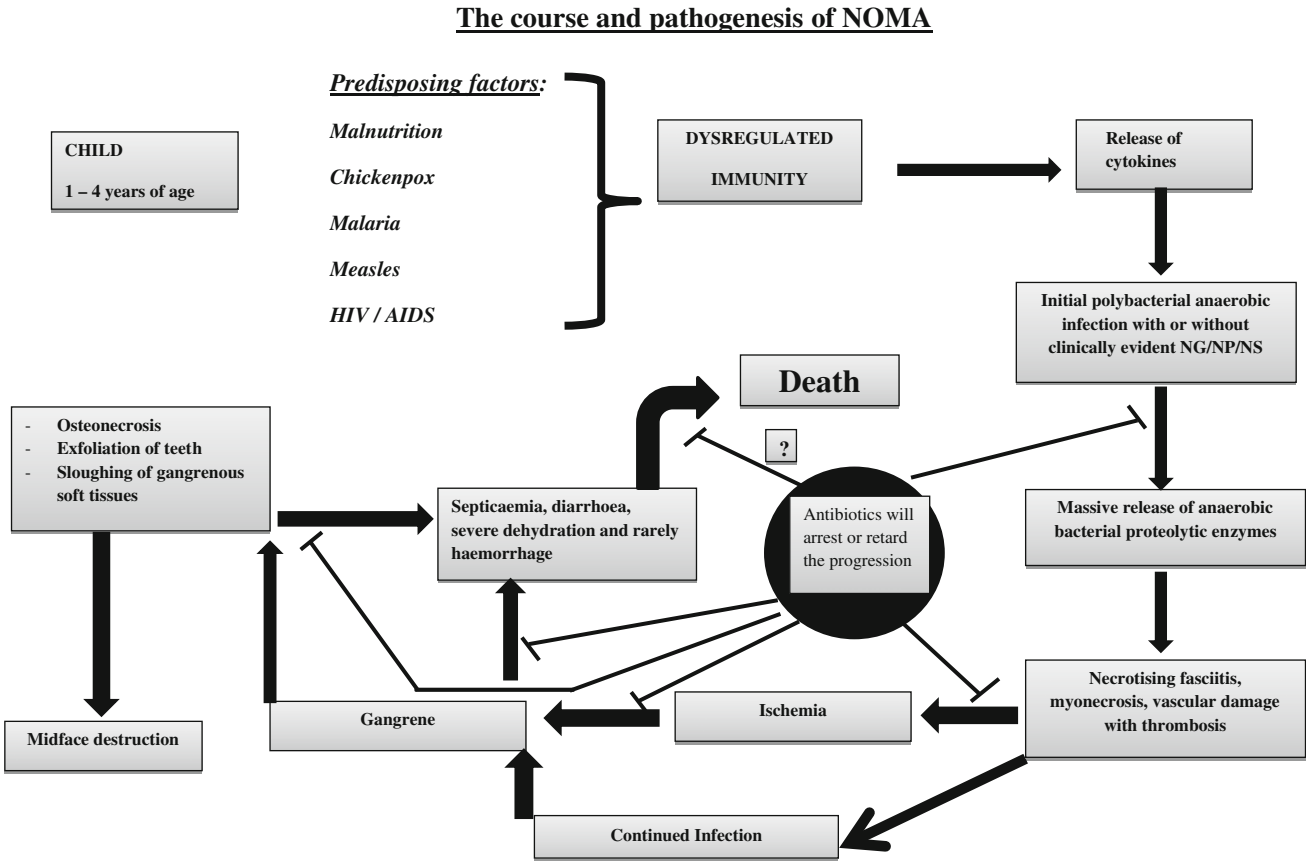

Fig. 5 The pathogenic events in noma and how antibiotic treatment affects the course of the disease

severely, and 28 % were moderately malnourished [10]. However, although NG is certainly prevalent in malnourished Nigerian children, noma is uncommon in this population group, indicating that other co-factors are essential for the development of noma [1, 2].

It is possible that in HIV-seropositive children who are not malnourished, the pathogenesis of noma is different to that in HIV-seronegative children who are malnourished; and that in malnourished HIV-seropositive children, like the child whose case we presented in this paper, the course of noma is more destructive. The role of malnutrition and HIV-seropositivity as co-predisposing factors for noma needs further investigation.

Our patient was HIV-seropositive most probably by infection from his mother. At admission, he had not yet been treated for HIV and he was malnourished, but once antibiotic treatment, electrolytes and fluids had been given, and his nutritional status had improved, the necrotic process was halted and the patient's general condition was markedly better. HAART was started soon after his admission, and his initial CD4+ T cell count of 6 cells/mm^3 increased to 59 cells/mm^3 within 3 months. It is not possible to determine whether the improved nutritional status or the improved immunological status following HAART, or the two acting together brought about the arrest of the acute phase of noma.

Our patient survived owing to the prompt diagnosis and prompt medical intervention after his hospital admission, but he now faces a lengthy, complex and daunting program of surgical treatment and functional rehabilitation, the outcome of which cannot be confidently predicted, but it is likely, at best, to be a compromise.

In the meanwhile he has a good appetite, manages mainly a diet of porridge and meat, and despite the extensive scarring around the defect, he is able to chew quite well, creates an anterior seal by pressing his tongue against the palate, and he has very little difficulty in swallowing. Despite the large facial defect, the boy does not complain of dryness of the mouth, and he sucks back drooled saliva. Quality of life is moderately good, and when at school or at play, he covers his face with a surgical mask.

References

1. Enwonwu CO, Falkler WA Jr, Phillips RS. Noma (cancrum oris). Lancet. 2006;368:147–56.
2. Enwonwu CO, Falkler WA Jr, Idigbe EO, et al. Noma (cancrum oris): questions and answers. Oral Dis. 1999;5:144–9.
3. Falkler WA Jr, Enwonwu CO, Idigbe EO. Microbiological understandings and mysteries of noma (cancrum oris). Oral Dis. 1999;5:150–5.
4. Baratti-Mayer D, Pittet B, Montandon D, et al. Noma: an "infectious" disease of unknown aetiology. Lancet Infect Dis. 2003;3:419–31.
5. Idigbe EO, Enwonwu CO, Falkler WA, et al. Living conditions of children at risk for noma: Nigerian experience. Oral Dis. 1999; 5:156–62.
6. Barrera J, Connor MP. Noma in an Afghani child: a case report. Int J Pediatr Otorhinolaryngol. 2012;76:742–4.
7. Bolivar I, Whiteson K, Stadelmann B, et al. Bacterial diversity in oral samples of children in Niger with acute noma, acute necrotizing gingivitis, and healthy controls. PLoS Negl Trop Dis. 2012;6:e1556.
8. Lazarus D, Hudson DA. Cancrum oris—a 35-year retrospective study. S Afr Med J. 1997;87:1379–82.
9. Paster BJ, Falkler WA Jr, Enwonwu CO Jr, et al. Prevalent bacterial species and novel phylotypes in advanced noma lesions. J Clin Microbiol. 2002;40:2187–91.
10. Tempest MN. Cancrum oris. Br J Surg. 1966;53:949–69.
11. Yuca K, Yuca SA, Cankaya H, et al. Report of an infant with noma (cancrum oris). J Dermatol. 2004;31:488–91.
12. Enwonwu CO, Falkler WA, Idigbe EO. Oro-facial gangrene (noma/cancrum oris): pathogenetic mechanisms. Crit Rev Oral Biol Med. 2000;11:159–71.
13. Ogbureke KU, Ogbureke EI. NOMA: a preventable "scourge" of African children. Open Dent J. 2010;4:201–6.
14. McAdam A, Sharpe A. Infectious diseases. In: Kumar V, Abbas A, Fausto N, editors. Robbins and Cotran pathologic basis of disease. 7th ed. Philadelphia: Elsevier Saunders; 2005. p. 343–414.
15. Feller L, Wood NH, Raubenheimer E. Complex oral manifestations of an HIV-seropositive patient. J Int Acad Periodontol. 2006;8:10–6.
16. Feller L, Lemmer J. Necrotizing periodontal diseases in HIV-seropositive subjects: pathogenic mechanisms. J Int Acad Periodontol. 2008;10:10–5.
17. Feller L, Wood NH, Raubenheimer E. Necrotising stomatitis in a HIV-seropositive patient: report of a case and a review of the literature. Perio. 2005;2:285–91.
18. Shangase L, Feller L, Blignaut E. Necrotising ulcerative gingivitis/periodontitis as indicators of HIV-infection. SADJ. 2004;59: 105–8.
19. Phiri R, Feller L, Blignaut E. The severity, extent and recurrence of necrotizing periodontal disease in relation to HIV status and CD4+ T cell count. J Int Acad Periodontol. 2010;12:98–103.
20. Wood NH, Blignaut E, Lemmer J, et al. Necrotizing periodontal diseases in a semirural district of South Africa. AIDS Res Treat. 2011;2011:638584.
21. Marck KW, de Bruijn HP. Surgical treatment of noma. Oral Dis. 1999;5:167–71.