Original article

CERVICOFACIAL NECROTIZING FASCIITIS SECONDARY TO ODONTOGENIC INFECTION IN A NIGERIAN POPULATION

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ABSTRACT

OBJECTIVE: This study aimed to present the clinical features, microbiological patterns of odontogenic infection and treatment outcome associated with cases of Cervicofacial necrotizing fasciitis (CNF) seen in a South-South Nigerian population.
METHODS: A 6-year retrospective review of patients diagnosed of CNF. The data analyzed were patients' age, gender, site of infection, implicated tooth, co-morbid conditions, microbiology profile, treatment modalities, length of stay in the hospital, treatment outcome and possible cause of death.
RESULTS: There were 6 patients diagnosed of CNF during the period of study, consisting of 2 (33.3%) males and 4 (66.7%) females, giving a ratio of 1:2. The patients' mean age was 59.5 $\pm$ 7.9 years (SEM) and 5 (83.3%) patients presented with associated medical conditions, among which 2 (33.3%) patients each had diabetes mellitus, hypertension and jaundice. Acute apical periodontitis was the most common odontogenic infection and the second mandibular tooth was the most frequently affected tooth type (n=4, 66.7%). All the patients presented with infected facial space swelling especially the submandibular space. Most of the patients had mixed bacterial infection, with *peptostreptococcus sp* and *klesiella sp* occurring in 2(33.3%) patients each. Most patients' (n=4, 66.7%) treatment included exodontia of infected tooth, fasciotomy, debridement, twice daily dressings and antimicrobial therapy. The mortality rate was 50%, with 3 patients, death resulting from septic shock (n=2, 33.3%) and thromboembolism (n=1, 16.7).
CONCLUSION: CNF in the head and neck region mimics facial space infections. A high index of suspicion is needed for prompt management of CNF. Mortality can thus be reduced by early diagnosis and treatment of the patients.

Key words: Cervicofacial, necrotizing fasciitis, odontogenic infection

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INTRODUCTION

Cervicofacial Necrotizing Fasciitis an unusual sequelae of odontogenic infection is a rapidly progressive, fatal, infection involving the soft tissues along fascia planes of the head and neck resulting in widespread necrosis of the skin. Although, the characteristics of the disease was described by Joseph Jones in 1871, the term necrotizing fasciitis was first introduced by Wilson in 1952.[1] It is considered rare in the head and neck regions when compared to its occurrence in the limbs, perineum, scrotum and abdomen.[1] Tooth related infections have been significantly implicated as the cause of the disease.[2] Others are trauma, insect bites, ear, nose, pharyngeal infections and infected jaw cysts.[3,-6] Mathieu et al. [7] reported that 75% of the 45 cases of CNF in the head and neck region was from odontogenic sources. Predisposing factors are cancers, chemotherapy, diabetes mellitus, chronic alcoholism, human immunodeficiency viral (HIV) infection, severe nutritional anaemia and renal problem.[1,8-10]

Early diagnosis and prompt intervention is key to successful treatment outcome. Attention is given to aggressive debridement, use of appropriate antibiotics, nutrition, removal of the source of infection and correction of predisposing implicated factors. Mortality and morbidity rates related to CNF is between 8.7 and 84%. Major causes of death include septicaemia, and multiple organ failure.[11]

Previous Nigerian studies have reported CNF from South-East, [9,12,13] North-West and North-Central [10] zones, highlighting the clinical features and management challenges. This study aimed to present the clinical features, microbiological patterns of odontogenic infection and treatment outcome associated with cases of CNF seen in a South-South Nigerian population.

MATERIALS AND METHODS

This is a retrospective study of patients diagnosed of CNF in the Oral and Maxillofacial Surgery Clinic, or referred from the General Surgery Units of the University of Benin Teaching Hospital, Benin City, Nigeria over a 6-year period (January 2011 and March 2017). The data obtained from the patients' clinical records were the patients' age, gender, site of infection, implicated tooth, co-morbid conditions, microbiology profile, treatment modalities, length of stay in the hospital, treatment outcome and possible cause of death.

RESULTS

There were 6 patients diagnosed of CNF during the period of study, consisting of 2 (33.3%) males and 4 (66.7%) females, giving a ratio of 1:2. All the patients were between the ages of 28 and 87 years and the patients' mean age was 59.5 $\pm$ 7.9 years (SEM). Five (83.3%) patients presented with associated medical conditions. Of the 2 (33.3%) patients with diabetes mellitus, 1 (16.7%) patient was treated with 3 courses of chemotherapy for cancer of the head of pancreas. There were 2 (33.3%) patients with hypertension and jaundice, with 1 (16.7%) case of renal failure with associated elevated blood urea level (uraemia) and 1 (16.7%) case of an alcoholic (Table 1).

Acute apical periodontitis was the most common odontogenic infection and the second mandibular tooth was the most frequently affected tooth type (n=4, 66.7%). All the patients presented with swelling involving facial spaces, with submandibular space infection involvement in all the case of CNF (Fig 1) and 2 (33.3%) cases had the infection extending beyond the neck to the anterior chest wall (Fig 3). In addition, the temporal (n=1, 16.7%) and submasseteric (n=2, 33.3%) spaces were affected.

As a routine in our Centre, intravenous antibiotic use preceded microscopy culture and sensitivity (MCS) test of the pus and necrotic tissues from the lesion. Empirical use of augmentin, metronidazole and gentamycin injections were given routinely until the MCS report was received. No sample of necrotic tissue was sent for histology. Most of the patients had mixed bacterial infection, with peptostreptococcus and klesiella spp occurring in 2 (33.3%) patients each (Table 1).

Most of the patients' (n=4, 66.7%) treatment included exodontia of infected tooth, fasciotomy to decompress swelling, debridement, twice daily dressings and antimicrobial therapy. One (16.7%) case was referred to the plastic surgery team for

Table 1: Summary of the 6 cases of CNF associated with odontogenic infection

S/N	Age years	Sex	Causative tooth	Co-morbidity	Hospital stay (days)	Causative agent	Treatment options	Outcome	Cause of death
1	68	M	Periodontal abscess 47	Cancer head of pancreas, Chemotherapy, Diabetic mellitus	23 days	*Escherichia coli*	Exodontia Fasciotomy Debridment	dead	Septicemic shock
2	28	F	Apical periodontitis 37	Hypertension, Jaundice	60 days	*Klebsella sp*	Debridment Honey dressing	dead	Thrombo-embolism
3	87	F	Acute periodontitis 47	Diabetes mellitus	19 days	*Staph aureus*	Exodontia, Fasciotomy debridment	alive	None
4	54	F	Post-exodontia of 36	Uraemia	4	*Klebsiella sp, Providencia sp*	Fasciotomy	dead	Septicemia shock
5	63	M	Acute apical periodontitis 47	Alcohol abuse, jaundice and hypertension	10	*Peptostrepto-ccocus, provetella*	Exodontia, Debridment Honey dressing	alive	None
6	57	F	Apical periodontitis 36	nil	14	*Peptostrepto-ccocus, fusobacterium*	Exodontia, Debridment Honey dressing	alive	None

Fig 1: CNF presenting as buccal and submandibular spaces.

Fig 2: CNF presenting as submandibular abscess extending to chest wall

split thickness skin graft but the patient was lost to follow-up. The mortality rate was 50%, with 3 patients' death resulting from septic shock (n=2, 33.3%) and thromboembolism (n=1, 16.7).

DISCUSSION

Cervicofacial necrotizing fasciitis is rare in the head and neck regions and odontogenic infection is significantly implicated as the cause of the disease.[1,2,7] However, there is variation in the frequency of CNF from reports of studies in different geo-political zones of Nigeria. Olusanya et al. (24 cases in 7 years), [12] and Obimakinde et al. (48 cases in 6 years) [9] reported large case series of CNF in a South-Western Nigeria population, whereas over a 6-year period a relatively lower frequency of CNF (6 cases) were found in a North-East and North-Central Nigeria by Fomete et al, [10] similar to the finding of this study in South-South Nigeria.

The mean age of patients in this study was 59.5 years, comparable with the findings of an earlier study by Obimakinde et al. (58.8 years),[9] but relatively older than the mean age of 45 years reported by Formete et al.[10] There is also a conflict on the gender distribution of CNF. Earlier study by Obiechina et al,[13] reported male predominance (5:3), whereas recent studies have reported a female preponderance [9,10,12] similar to the report in this study, which has been attributed to the health seeking qualities of female.

The most common cause of CNF is from odontogenic origin and mandibular molar tooth is often involved, [9] which agrees with the findings in this study. Early recognition of the clinical features of CNF is key to successful treatment outcome because CNF has an innocuous presentation. It is often difficult to make an initial and prompt clinical diagnosis. The initial presentation of CNF mimics odontogenic facial space infections. A similar clinical pattern of CNF was observed in this study and this poses a diagnostic dilemma to the unsuspecting surgeon. However, variation in the clinical presentation of CNF was reported in a case series of 7 patients by Lee et al. [14] The most common presenting symptoms were sore throat, fever and neck pain. Also, in a larger review of CNF cases over a 12-year period, neck cellulitis and pain were the most constant feature.[15]

Frequently, diagnosis is made about 48 hours after initial presentation when an incision and drainage is being carried out. Erythema, dark and dusky grey skin, cutaneous anaesthesia, vesicle formation, subcutaneous crepitation and sloughing of fascia, copious amount of "dish water" exudate and necrotic matter were evidently seen.[11] In this study series, the submandibular space was involved in all the patients. The extent of spread of the CNF may have contributed considerably to the cause of death. Two (33.3%) cases of CNF extended to the anterior chest wall with fulminating infection, and a delay in intervention probably due to lack of finance to pay for services in the hospital and the practice of self-medication or use of traditional herbs may have contributed to the poor treatment outcome observed in some patients in this study.

Several factors have been identified to increase the mortality and morbidity in CNF. These are the pre-existing systemic disease, delay in referral, low finance status, older age and extent of spread. Lin et al., [15] 2001 reported that 89.4% of cases had an underlying systemic disease with over three-quarters being diabetic patients. Nutritional anaemia was the most common underlying factor which was followed by diabetes mellitus in a Northern Nigerian study.[10] Similarly, a high (83.3%) frequency of co-morbid condition was found in this study. Diabetes mellitus, hypertension and jaundice reported as the most frequent pre-existing medical conditions in these patients. On the contrary, a previous study [12] reported that 54.2% of CNF patients had no pre-morbid condition. However, only 1 (16.7%) patient had no pre-morbid condition in this study.

CNF is a mixed infection and the causative organisms are varied. With improved diagnostic culture techniques more organisms will be added to the list. In CNF it is known that anaerobes surpass aerobes and facultative bacteria. It is believed to be a synergistic interaction between the aerobic and the anaerobic organisms in the aetiology of the disease. The classical infective agents reported in cases of CNF are: β-*Haemolytic streptococci, staphylococci and obligate anaerobes*.[8,16,17] Furthermore, previous Nigerian study reported culture of *Streptoccocus pyogenes, Pseudomonas sp* and *Staphylococcus*

aureus.[10] However, the organisms cultured in this study included both monomicrobial organism and polymicrobial organisms consisting of *Staphylococcus aureus, Escherichia coli, Klebsiella sp, Peptostreptoccoucus, Fusobacterium, Provetella spp and Providencia sp.* These findings support variation and emergence of different microbiological patterns in odontogenic infections associated with CNF.

The treatment methods in this study were extraction of all affected teeth, fasciotomy, wound debridement, 12 hourly dressings with honey, skin grafting of granulated wound and antimicrobial therapy. Similarly, these treatment options for CNF have been reported in previous studies. [10,12] In addition, the importance of hyperbaric oxygen and immunoglobulin injections have been highlight with very satisfactory results. [12]

The complications of CNF include: septic shock, airway obstruction, jugular venous thrombophlebitis, carotid artery rupture, aneurysm, thrombophlebitis with hemiplegia, facial artery necrosis, laryngocutaneous fistula, disseminated intravascular coagulation, mediastinitis, pericarditis, pleural effusion, empyema, pericardial effusion, pneumonitis, cardiac tamponade, esophageal bleeding and multisystem failure. [1,4,7] Accordingly, 3 (50.0%) of the patients in this series died from complications of the CNF, with overwhelming septicaemia and shock in 2 (33.3%) patients and 1 (16.7%) case died from thromboembolism.

In conclusion, CNF in the head and neck region mimics facial space infections. A high index of suspicion is needed for prompt management of CNF. Mortality can thus be reduced by early diagnosis and treatment of the patients before the spread of CNF downward to the chest wall and mediastinum.

No conflict of interest is declared in this study.

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