Necrotizing fasciitis in childhood
Case report, and review of the literature

Ann. Ital. Chir., 2009; 80: 189-192

Epaminondas Kostopoulos, Kostas Koulopoulos, Nicoletta Kalantzi, Nectarios Lainakis, Kyriakos Skannavis, Athanasios Kourakos, Vassilios Trapalis

Department of Pediatric Surgery, Nikea General Hospital, Pireus, Greece

Necrotizing fasciitis in a childhood. Case report and review of the literature

INTRODUCTION: *Necrotizing fasciitis (NF) is an aggressive and relatively rare soft tissue infection, involving the fascia and the subcutaneous tissue, with a rapidly fatal evolution.*
CASE REPORT: *GE, an 8 year-old girl presented with edema and redness of the external genitalia. Twelve hours later, she became toxic while her redness extended in the abdominal wall and both upper thighs. CT of the abdomen was consistent with NF. She underwent prompt surgery (debridement and colostomy), followed by plastic reconstruction.*
CONCLUSION: *Early suspicion and prompt aggressive surgery is the key of therapy in case of NF.*

KEY WORDS: Early diagnosis, Necrotizing fasciitis (NF), Surgical debridement, Superficial fasciitis.

Introduction

Necrotizing fasciitis (NF) is an aggressive and relatively rare soft tissue infection, involving the fascia and the subcutaneous tissue, with a rapidly life-threatening evolution. Early suspicion and diagnosis is of paramount importance. In this article it will be presented a case affecting a child observed and treated in our hospital.

Case report

An 8 year-old young female with a recent varicella infection referred an injury at her external genitalia area (e.g. labia majora). She presented at the emergency department with a severe redness and edema in the above mentioned area. This clinical picture was consistent with cellulitis; the patient was admitted to the hospital where i.v. antibiotics were given. Twelve hours later edema and redness spread in the abdominal wall and both thighs associated with an inability to move both hip joints, while the patient presented toxic symptoms. On the light of the new elements the initial diagnosis changed and the new differential diagnosis included either septic arthritis or necrotizing fasciitis (NF). A CT of the abdomen and the lower limbs was ordered, which demonstrated air in the junction of skin and subcutaneous fascia along the extended area of the abdominal wall-upper thigh, which was consistent with NF. Her situation became critical and the patient was sent to an ICU, where she was intubated and went to the OR in an emergency basis. She underwent debridement of the necrotic tissue and colostomy, followed later on by plastic reconstruction and closure of the colostomy.

Discussion

Necrotizing fasciitis is a rare primarily adult disease [1-3] which was first described by Jones [4] in the 19th century as a complication of the gunshot wounds during the American Civil War. Meleney [5], in 1924, reported 20 cases of patients infected by hemolytic *Streptococcus* gangrenes secondary to insect bites and or other minor traumas. The term "necrotizing fasciitis" is attributed to Wilson [6], who in 1952 described 22 patients with a rapidly progressive infection and necrosis of the subcu-

Pervenuto in Redazione Dicembre 2007. Accettato per la pubblicazione Luglio 2008.
For correspondence: Dr Epaminondas Kostopoulos, MD, Department of Pediatric Surgery, Nikea General Hospital, 3 Mantoubalou street, 15484 Pireus, Greece (e-mail:thkoul@yahoo.gr).

taneous tissue, superficial fascia and superficial part of the deep fascia with or without the presence of cutaneous gangrene, caused by different etiologies (e.g. wounds, abrasions, lacerations, and insect bites).
Concerning the pediatric population, Meleney [7] in 1930, first reported a case of NF in a child after scarlet fever. However, it was not until 1970s when Wilson and Haltalin [8] described a small series of pediatric patients presented with soft tissue infections of streptococcal and staphylococcal etiology.
In the adult population NF often appears secondary to a combination of severe systemic conditions (ie, diabetes, immunosuppression, alcoholism, chronic renal failure, obesity, peripheral vascular disease, intravenous drug abuse) and to local risk factors (minor traumas, dental problems, herpes infection etc.). However, in children NF occurs most of the time in previously healthy subjects [8, 9].
In neonates, NF was the result of a secondary infection, such as mammitis [10, 11], omphalitis [12], balanitis [13], fetal scalp monitoring [14], bullous impetigo 15, and postoperative complications [16]. Other etiologies included septicemia [17], necrotizing enterocolitis [18], and immunodeficiency [19]. Primary NF is a very rare entity in this population.
Primary varicella seems to be a predisposing factor in the occurrence of NF in children. According to Zerr et al. association of varicella with the use of ibuprofen contributes apparently to the appearance of NF [20]. However, more studies needed to confirm this issue. We think that the immunosuppressive state of this infection could contribute to the appearance of NF.
NF generally involves mostly the abdominal wall, the extremities, the perineum, the pelvis and finally less often the head and neck area [21].
NF is divided into two groups depending on the responsible infectious agent. Subsequently, in the first group belong cases caused by a polymicrobial infection (anaerobic and aerobic), while in the second group only *Streptococcus pyogenes* is identified alone [22, 23].
Histologically, the specimens showed a widespread angiothrombotic microbial invasion of the fascia [24]. As the disease progresses, skin ischemia is caused by occlusion of its perforating nutrient vessels.
Recently, a subacute form of NF has been reported [25, 26, 27, 28].This form is characterized by an indolent initial presentation (minimal pain and systemic symptoms), followed by a sudden deterioration and rapid progression. Immunocompromised patients are more often affected. However, this entity concerns the adult population.
Early diagnosis is of paramount importance. Clinical suspicion remains the best way to make the diagnosis and treat the patient. Chao et al. presented ultrasonography use as an additional diagnostic tool with good results [29]. CT imaging demonstrated soft tissue swelling, enhancement, fluid, and gas of the affected areas [30, 31, 32, 33, 34], while MRI studies showed deep fascial thickening, deep fascial fluid collections, and hyperintense T2-weighted signal within the muscles [35, 36].
Aggressive surgical treatment is the mainstay of therapy. It is interesting that Wakhlu et al. [37], proposed a more conservative management of NF in children with good outcome. Apparently is early to judge this method, which needs more studies.

Conclusion

A case of an 8 year -old girl with NF during the immediate varicella recovering period associated with a minor trauma was presented. No ibuprofen use was reported. The rapid clinical deterioration despite the i.v. antibiotherapy provided the clinical suspicion and diagnosis. Aggressive surgical debridement was the critical point, which changed the final outcome. We agree with other investigators opinion for early diagnosis and emergency surgery. Ultrasonography could offer an additional diagnostic tool but its use is not generalized. Conservative approach remains a disputable issue which should be taken in consideration once the diagnosis is made.

Riassunto

INTRODUZIONE: La Fascite Necrotizzante (FN) è una aggressiva e rara infiammazione dei tessuti che interessa la fascia e il tessuto sottocutaneo, ed ha una evoluzione naturale veloce e mortale.
DESCRIZIONE DEL CASO: GE, bambina di otto anni che si presenta con edema e arrossamento sulla parte esterna degli organi genitali: dopo 12 ore sviluppa sintomi tossici mentre l'arrossamento si è esteso dalla regione ipogastrica alla radice di entrambe le cosce. La CT della parete ipogastrica era indicativa dell'esistenza di una FN. La bambina è stata dunque sottoposta ad un intervento chirurgico, con sbrigliamento delle zone necrotiche e confezione di una colostomia, e successiva ricostruzione plastica.
CONCLUSIONE: Una diagnosi precoce e un intervento chirurgico tempestivo sono le chiavi per la soluzione positive della FN.

References

1) Heinrich RE, Smith TL, Mukherji S: *Pediatric craniocervical necrotizing fasciitis.* Ann Otol Rhinol Laryngol, 1996; 105: 72-74.

2) Feinermman IL, Tan H, Robertson D, et al: *Necrotizing fasciitis of the pharynx following adenotonsillectomy.* Int J Pediatr Otorhinolaryngol, 1999; 48: 1-7.

3) Mohammedi I, Ceruse P, Duperret S, et al: *Cervical necrotizing fasciitis: 10 years experience at a single institution.* Intensive Care Med, 1999; 25: 829-34.

4) Jones J: *Investigation upon the nature, cause, and treatment of*

hospital gangrene as it prevailed in the Confederate Armies 1861-1865 in Surgical Memories of the War of Rebellion. In: Jones J (ed): *US Sanitary Commission,* New York, 1871.

5) Meleney FL: *Hemolytic Streptococcus gangrene*. Arch Surg, 1924; 9: 317-35.

6) Wilson B: *Necrotizing fasciitis*. Am Surg, 1952; 18: 416-31.

7) Meleney FL: *Hemolytic Streptococcus gangrene following scarlet fever antitoxin.* Am Surg, 1930; 91: 287-88.

8) Wilson HD, Haltalin KC: *Acute necrotizing fasciitis in childhood. Report of 11 cases*. Am J Dis Child, 1973; 125: 591-95.

9) Moss RL, Musemeche CA, Kosloske AM: *Necrotizing fasciitis in children: prompt recognition and aggressive therapy improve survival*. J Pediatr Surg, 1996; 31: 1142-6.

10) Kosloske AM, Cushing AH, Borden TA, et al.: *Cellulitis and necrotizing fasciitis of the abdominal wall in pediatric patients*. J Pediatr Surg, 1981; 16: 246-51.

11) Bodemer C, Panhans A, Chretien-Marquet B, Cloup M, Pellerin D: *Staphylococcal necrotizing fasciitis in the mammary region in childhood: a report of five cases*. J Pediatr, 1997; 131:466-69.

12) Stunden RJ, Brown RA, Rode H, Millar AJW, Cywes S: *Umbilical gangrene in the newbor*n. J Pediatr Surg, 1988; 23: 130-34.

13) Bliss DP. Jr, Healey PJ, Waldhausen JHT: *Necrotizing fasciitis after plastibell circumcision*. J Pediatr, 1997; 131: 459-62.

14) Siddiqi SF, Taylor PM: *Necrotizing fasciitis of the scalp: a complication of fetal monitoring*. Am J Dis Child, 1982; 136: 226-28.

15) Weinberger M., Haynes RE, Morse TS: *Necrotizing fasciitis in a neonate*. Am J Dis Child, 1972; 123: 591-94.

16) Farrel LD, Karl SR, Davis PK, Bellinger MF, Ballantine TVN: *Postoperative necrotizing fasciitis in children*. Pediatrics, 1988; 82: 874-79.

17) Nutman J, Heninng E, Wilunsky E, Reisner SH: *Acute necrotizing fasciitis due to streptococcal infection in a newborn infant*. Arch Dis Child, 1979; 54: 637-39.

18) Epps C, Brown M: *Necrotizing fasciitis: a case study*. Neonatal network, 1997; 16: 19-25.

19) Lin CY, Hsu CH, Liu KC, Chen CL, Hsu HC: *Serial immunologic and histopathologic studies in the treatment of necrotizing fasciitis with combined immunodeficiency by a bovine thymic extract (Thymostimulin)*. J Pediatr Surg, 1986; 21: 1000-4.

20) Zerr DM, Alexander R., Duchin JS, Koutsky LA., Rubens CE: *A case-control study of necrotizing fasciitis during primary varicella*. Pediatrics, 1999; 103 (4): 783-90.

21) Bahna, M., Canalis, RF: *Necrotizing fasciitis (streptococcal gangrene) of the face. Report of a case report and review of the literature*. Arch Otolaryngol, 1980; 106: 648-51.

22) McGee EJ: *Necrotizing fasciitis: review of pathophysiology, diagnosis, and treatment*. Crit Care Nurs Q, 2005; 28 (1): 80-4.

23) Wong C-H., Chang H-C, Pasupathy S, Khin L-W, Low C-O: *Necrotizing fasciitis: clinical presentation, microbiology, and determinants of mortality*. J Bone Joint Surg Am, 2003; 85: 1454-60.

24) Wong C-H, Song C, Ong Y-S, Tan B-K, Tan K-C, Foo C-L: *Abdominal wall necrotizing fasciitis: it is still "Meleney's minefield"*. Plast Reconstr Surg, 2006; 117 (7): 147-50.

25) Wong C-H., Tan S-H: *Subacute necrotizing fasciitis*. Lancet, 2003; 364: 1376.

26) Saliba WR, Goldstein LH, Raz R, Mader R, Colodner R, Elias MS: *Subacute necrotizing fasciitis caused by gas-produsing Staphylococcus aureus*. Eur J Clin Microbiol Infect Dis, 2003; 22: 612.

27) Chosidow O: *Subacute forms of necrotizing fasciitis and necrotizing cellulitis: Diagnosis criteria and surgical decision-making*. Ann Dermatol Venereol, 2001; 128: 390.

28) Jarret P, Rademaker M, Duffil M: *The clinical spectrum of necrotizing fasciitis. A review of 15 cases*. Aust N Z J Med, 1997; 27: 29.

29) Chao H-C., Kong M-S, Lin T-Y: *Diagnosis of necrotizing fasciitis in childre*n. J Ultrasound Med, 1999; 18: 277-81.

30) Beltran J: *MR imaging of soft tissue infection*. Magnet Reson Imaging Clin North Am, 1995; 3: 743.

31) Brothers TE Tagge, DU, Stutley J: *Magnetic resonance imaging differentiates between necrotizing and non-necrotizing fasciitis of the lower extremity*. J Am Coll Surg, 1998; 187: 416.

32) Wysoki MG, Santora TA, Shah RM., Friedman AC: *Necrotizing fasciitis: CT characteristics*. Radiology, 1999; 203: 859.

33) Becker M., Zbaren P, Hermans R: *Necrotizing fasciitis of the head and neck: role of CT in diagnosis and management*. Radiology, 1997; 202: 471.

34) Walshaw CF, Deans H: *CT findings in necrotizing fasciitis: a report of four cases*. Clin Radiol, 1996; 51: 429.

35) Schmid MR, Kossman T, Duewell S: *Differentiation of necrotizing fasciitis from cellulitis using MR imaging*. A J R Am Roedgenol, 1998; 170: 615.

36) Rahmouni A, Chosidow O, Mathieu D: *MR imaging in acute infectious cellulites*. Radiology, 1994; 192: 493.

37) Wakhlu A, Chaudhary A., Tandon RK, Wakhlu AK: *Conservative management of necrotizing fasciitis in childre*n. J Ped Surg, 2006; 41: 1144-48.