Clinico-Microbiological Aspects of Necrotising Fasciitis in Type II Diabetes Mellitus

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Abstract Necrotising fasciitis is insidiously advancing soft tissue infection, characterized by widespread fascial necrosis. One of the most common conditions encountered in the clinical practice and which required clinical suspicion in patients who have less resistance to these infections. Especially in diabetic patients who are more prone for such infection due to low immunity and other reasons like early detection of these infections helps these patients to have a better recovery by aggressive surgical management and other measures required for the same. Literature has enough evidence on how serious this entity. Hence this study is designed in that aspect to help in early diagnosis and appropriate treatment. This study will help to determine the clinical presentation, the polymicrobial involved. The organisms most closely linked to necrotizing fasciitis are group A beta-hemolytic streptococci, although the disease may also be caused by other bacteria and their sensitivity patterns will help us to install appropriate antibiotics with the surgical management. And to compare our mortality rate with the other studies. A prospective descriptive study including all type II diabetic patients with necrotizing fasciitis over 3 years. Patients were evaluated in detail with respect to patient's history, examination, culture sensitivity and chart reviews and followed up using standard evaluation tools to measure the various outcomes. In 62 patients, the commonest clinical presentation was necrotic patch of skin and cellulites. The organisms cultured being beta hemolytic streptococci and E.Coli. The culture sensitivity pattern is to broad-spectrum antibiotics. The average stay in

the hospital was about 13.74 days for the study group and the time delay in presentation is 6 days. Wagner's score is a useful tool for aiding the diagnosis. Patients without foot care had extensive lesions. And a mortality rate of 1.6 % in these patients. In an acutely swollen limb in a diabetic patient a high degree of suspicion of necrotizing fasciitis is required. A detailed foot care is warranted in these patients. An early extensive debridement is mandatory and key for a favorable outcome. And to start on broad-spectrum antibiotics is advisable. Wagner's scoring is helpful to predict the chances of a second surgery. With the above entities in mind the mortality rate of necrotizing fasciitis in type II diabetes mellitus can be contained.

Keywords NF · Necrotizing fasciitis · Type II diabetes mellitus · Polybacterial infections

Introduction

Necrotising fasciitis is a rapidly progressive and potentially fatal disease condition. It is characterized by progressive inflammation and extensive necrosis of the subcutaneous tissue and fascia [1]. Necrotising fasciitis was first described in 1848. In 1920, Meleney identified 20 patients in China in whom hemolytic streptococcus was the sole organism. Wilson coined the term necrotizing fasciitis in 1952 and found no specific pathologic bacteria related to the disease. Soft tissue infections that cause necrosis are more serious because of their propensity for extensive tissue destruction and high mortality rates [2, 3]. The nomenclature for necrotizing soft tissue infections is confusing. Attempts to differentiate these infections on the basis of predisposing conditions, presence of pain, toxic condition, fever, presence of crepitus, appearance of the skin and subcutaneous tissues,

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and presence of bullae are of little help in diagnosis or initial treatment. Bacteria seldom respect anatomic barriers, and hence necrotizing fasciitis is rarely limited to fascia and myonecrosis is frequently not limited to muscle.

Necrotizing fasciitis is caused by polybacterial infection and associated with profound systemic toxicity. Characterized by a wide spread tissue necrosis underlying a viable skin, and the only visible signs for the same may be skin areas of necrosis, fluid filled vesicles, and severe sepsis [4]. Hence it is important to know the various presentation and the organisms associated in our set up to recognize this clinical entity to give appropriate treatment for the patients since the mortality associated with it is about 70% in most of the literature. The outcome of necrotizing fasciitis is influenced by the early recognition and extensive surgical treatment and starting of broad spectrum antibiotics [5].

Necrotizing fasciitis in diabetes mellitus type II has a similar prognosis if not recognized early and appropriate treatment to be installed as early as possible. Hence detailed information regarding the clinical presentation, the organisms causing it and other factors involved in necrotizing fasciitis is warranted to aid in the proper diagnosis, management and the final outcome of the disease is essential for a holistic treatment necrotizing fasciitis in diabetes.

Aims and objectives

Study was designed to document the natural history of patients with necrotizing fasciitis in type II diabetes mellitus in an urban metropolis hospital. Elucidate the clinical and microbiological aspect of necrotizing fasciitis in our set up over the past three years. Document and analyse the outcome of management of necrotizing fasciitis and the factors affecting it. To make a protocol for diagnosing, appropriate antibiotics in necrotizing fasciitis in type II diabetic patients. Compare our mortality rate with the other studies

Materials and methods

Our study is a prospective descriptive study. The study population consists of total of 62 patients with Type II diabetes mellitus and necrotizing fasciitis involving the extremities. Inclusion criteria was all adult type II diabetes mellitus patients admitted to an urban metropolis hospital from April 2005 to April 2007 who were diagnosed to have necrotizing fasciitis. Patients other than diabetes mellitus type II admitted in an urban metropolis hospital who were diagnosed to have necrotizing fasciitis were excluded. Patients were informed consent taken as per the institution rules and no additional test or procedure done apart from the standard treatment procedure. The procedures followed

were in accordance with the Helsinki Declaration of 1975, as revised in 2000. The Institutional Review Board approved the study.

Patient's admitted with necrotizing fasciitis were evaluated in detail with respect to patient's history, examination and chart reviews. All patients were ruled out for peripheral vascular disease and deep vein thrombosis. Tissue for culture and histopathology was sent and work up for sepsis done. All details were entered in the Performa designed for entering the data, recording of treatment, antibiotics used, surgical procedures and outcome of every patient was recorded and analyzed. Data analysis done using Pearson's chi square statistic to identify univariate differences with respect to diabetic status and variables with respect to morbidity and mortality. The Statistical software namely SPSS 11.0 and Systat 8.0 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc.

Results

The study group consists of 62 type II diabetic patients out of which 77.4% of the patients were male and 22.6% females. Out of which there 43.5% had controlled sugars. And the majority was a population with uncontrolled diabetes accounting for 56.5% of the population. The mean average age was 56.6 years, and a standard deviation of 10.22 years.

Age groups	No. of patients	Percentage
35- 54	20	32.3
55-64	19	30.6
>60	23	37.1
Total	62	100.0

The study group consists of 62 type II diabetic patients out of whom 77% were male patients and 23% female's patients, 43.5% had controlled sugars and the 56% were with uncontrolled diabetes. The average stay in the hospital was about 13.74 days for the study group and the time delay is about 6 days after the onset of the symptoms.

	N	Minimum	Maximum	Mean	Std. Deviation
NO_DAYS	62	4	42	13.74	7.78
TIME DELAY IN DAYS	62	2	20	6.08	3.86

And when compared with diabetic status Vs age we found the younger group had a better controlled sugar levels in the study groups. Comparison of diabetic status and the duration of hospital stay had no much statistical significant relation with respect to the controlled or

uncontrolled status of the patient in the study group. The Wagners score used to assess the clinical score on presentation, the patients predominantly presented with a maximum score of 3. And the most frequent belong to score 0 i.e., 51.6 % wherein had some Pre-ulcerative lesion, Healed ulcers, bony deformity. Foot care was lacking in most of the patients only 37 % practiced regular foot inspection. Patients without foot care have a 62% of lesion and they also have a high Wagner's score compared to the patients who followed foot care. In the study it was found that the lesser the Wagner's score 70% less likely for a second surgery. Clinical presentation is variable. The commonest presentations being necrotic patch of skin and cellulitis making up for 50% of the study population. Out of the 62 patients 51% had systemic complications; hypotension was 37% of the complication on initial presentation. Diabetic complication 3% had all the three complication; Neuropathy being 45%. Otherwise the complication was equal in distribution in the 62 patients. 12 patients 19% had no diabetic complications. Cultured organism the most common organism grown in our clinical set up being beta-hemolytic streptococci 20%, E.coli 20 % and Enterococcus 17%. Sensitivity pattern most commonly sensitive to cephalosporins in 30%, penicillin's (23%) and amino glycosides (16%). Repeat culture were predominantly gram negative bacilli rather than cocci. All of them had underwent a initial debridement and 8% also underwent disarticulation along with it and 1 also underwent transmetatarsal amputation. 33% of the patients needed to be operated again after the initial surgery. Patients presenting with necrotic patch of skin had 50% chances of second surgery and extensive surgical debridement, similarly patients presenting with superficial ulcer and cellulitis. 50% of the population with fascia involvement at initial debridement required another debridement. But patients with involvement of muscle had more extensive procedure 9% below knee amputation. But the end result most of them recovered 25% of the study population, 72 % required a surgical procedure for healing. Our setup we had a very less mortality with necrotizing fascitis comparison with other studies. In our present series we had a low mortality rate since the study dealt with only diabetic patients and the other studies have taken necrotizing fascitis as a whole

	DM CONTROL	N	Mean	Std. Deviation	P value
AGE	Controlled	27	54.89	9.53	>0.05
	Uncontrolled	35	57.89	10.68	

	DM CONTROL	N	Mean	Std. Deviation	P value
NO_DAYS	Controlled	27	14.30	8.97	>0.05
	UnControlled	35	13.31	6.83	

Wagners score	Frequency	Percent	Valid Percent	Cumulative Percent
0	32	51.6	51.6	51.6
1	25	40.3	40.3	91.9
2	4	6.5	6.5	98.4
3	1	1.6	1.6	100.0
Total	62	100.0	100.0	

Foot care	WAGNERS				Total
	0	1	2	3	
No	23 (58.9%)	12 (48 %)	3 (75%)	1 (100%)	39 (62%)
Yes	9 (39.1%)	13 (52%)	1 (25%)		23 (38%)
Total	32	25	4	1	62

Wagners score	Second surgery		Total
	BKA	DEBRIDEMENT	
0		9	9
1	2	9	11
2			0
3		1	1
Total	2	19	21

Clinical presentation

CLINICAL FINDINGS	SECOND SURGERY			Total
	BKA	DEBRIDEMENT	NO SURGERY	
NECROTIC PATCH	1	8	8	17
CELLULITIS		5	9	14
SKIN ERYTHEMA		1	9	10
SUPERFICIAL ULCER		4	4	8
ULCER	1		4	5
ULCER WITH CELLULITIS		1	2	3
BLEBS			3	3
TENDER SWELLING			2	2
Total	2	19	41	62

Antibiotic	Sensitivity	Percentage
Vancomycin	15	24.2%
Cefaperazone and salbactam	32	51.6%
Cefaperazone and pencillin	12	19.4%
Ciprofloxacin and pencillin	3	4.8%
Total	62	100

EXTENT OF INVOLVEMENT	SECOND SURGERY			Total
	BKA	DEBRIDEMENT	NO SURGERY	
MUSCLE INVOLVED	2	6	13	21
UPTO THE FASCIA		13	28	41
Total	2	19	41	62

Discussion

Necrotizing fasciitis is a common infection encounter in our clinical set up. This study was designed only for type II diabetes mellitus patients with lower limb necrotizing fasciitis hence makes it unique done so far.

Our primary intention was to early diagnosis based on the natural history of the condition so that prompt and effective management of necrotizing fasciitis in type II diabetes mellitus in an urban metropolis hospital. In our experience most common mode of onset of symptoms is spontaneous (65%) in nature. but clinical presentation is variable and hence mode of onset has no much value in predicting the course of the disease. Clinical findings may just be cellulitis but when a bleb or a patch on an acutely swollen limb is seen during the course of admission don't wait for the antibiotic to act surgical intervention [6] is all required and a extensive surgical management is mandatory to eradicate the extension of NF's fatal effects to achieve a good outcome. Hence one should have a good clinical knowledge to watch for the warning signs of patch, blebs on an acutely swollen limb. And act accordingly and not wait for it to demarcate with antibiotics [7].

Our study also made a note on the common organisms possible with necrotizing fasciitis in our setup which will

give a guide on the most empirical treatment early in the course of the hospital stay rather than wait for the culture sensitivity reports [8]. This was our secondary end point especially in paediatric group [9] where the time is limited to wait for cultures. Sensitive pattern [10] also served the same purpose to be ahead and act promptly in reducing the overall mortality rate. This helped our surgical management better results. This study thus enables our diabetic patients with NF to recover much faster and have less morbidity and mortality. And when compared to other studies reduced mortality rates.

Another highlight is the importance of the Wagners score and foot care as part of clinical examination and should be included deciding on the promptness of the early installation of an aggressive treatment plan. Patients without foot care have a 62% of lesion and of worse grade of the lesion compared to the patients who followed foot care. In the study it was found that the lesser the Wagner's score 70% less likely for a second Surgery. All of them had underwent an initial debridement and 8% also underwent disarticulation along with it and one patient also underwent transmetatarsal amputation. 34% of the patients had myonecrosis and 66% of the patients had involvement of fascia alone. And 50% of the population with fascia involvement at initial debridement required another debridement. But 9% of the muscle involved underwent below knee amputation. Wagners score and foot care is not so emphasized in most of the studies.

Out of the 62 patients 51% had systemic complications; hypotension was 37% of the complication on initial presentation. 25% of patients wound needed no surgical procedure for wound healing [11], 72 % required a surgical procedure. Our set up we had a very less mortality with necrotizing fasciitis. In comparison with the other studies in the past we had better mortality rate.

We do have few limitations we have not done a comparative study with our exclusion criteria which have got more information and strength and possibly estimated the incidence and comparison in outcome between the two groups.

Conclusion

Necrotizing fasciitis is a common condition encountered in our setup and high degree of suspicion is required acutely swollen limb in a diabetic patient. A detailed foot care is essential in these patients as they are prone for more severe infection than those followed foot care. An early extensive debridement is mandatory and key for a favorable outcome. And to start on broad spectrum antibiotics as soon as suspected necrotizing fasciitis [12] is advisable. Wagner's scoring is helps to predict the chances of a second surgery. And to sum up in a diabetic patient with lower limb swelling, no foot care, hemodynamic instability and spreading lesion. Start on 3rd generation cephalosporins and an extensive debridement [13]. Reassess after 72 hours and plan for a second surgery if wound not clean. Clean wounds continue dressing and discharge and follow up for dressing on OPD basis. Admit the patient if wound has satisfactory granulation tissue and repeat culture and plan for skin graft or secondary suturing [14].

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