

# Study of surface area involvement as a mortality indicator in necrotizing fasciitis

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## Abstract

**Objective:** The objective of this study was to determine the importance of involved surface area by Necrotizing fasciitis as a mortality indicator in patients presenting with Necrotizing Fasciitis. This prospective study was conducted at Government medical college, Nagpur, over a period of two years from March 2008 to May 2010. **Methods:** This is a prospective study. Total 64 patients were enrolled for study. The sample was divided into 2 groups: survivors and non survivors. The involvement of body surface area was calculated using Lund and Browder chart. After resuscitation, the patients underwent the emergency, aggressive surgical debridement. Post-operatively, the patients were managed in surgical wards. The patients requiring post operative specialized services (e.g. skin grafting) were referred to respective specialties (e.g. plastic surgery unit). The patients were then followed up in outpatients department. **Results:** The common clinical manifestations include redness, swelling, abscess formation, pain, fever, skin necrosis and foul smelling discharge etc. Necrotizing fasciitis has mortality of 14 (22%) in present study. 22 (34.375%) patients have less than 5 % of body surface area involvement. The most common predisposing factor associated was Diabetes mellitus whereas the most commonly involved site was perineum. The *P* value was found to be 0.001. There is significant linear correlation found between involved surface area by Necrotizing fasciitis with mortality. All patients underwent aggressive and extensive surgical debridements. The common additional procedures included Skin grafting, Secondary suturing, and Orchiectomy. **Conclusion:** Involvement of more body surface area in necrotizing fasciitis is associated with increase mortality.

**Keywords:** Mortality Indicator, surface area, Lund and Browder chart, Necrotizing Fasciitis.

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## INTRODUCTION

Necrotizing fasciitis is considered progressively destructive and invasive infection of skin, subcutaneous tissue and deep fascia. It spreads aggressively along the fascial planes.<sup>1-3</sup> Necrotizing infection of the perineum was initially described by Fournier in 1884<sup>4</sup> and Wilson was first to coin the term necrotizing fasciitis in 1952.<sup>5</sup> Involvement of the surface area as an important prognostic factor was the focus of our study. This factor

is calculated by using simple Lund and Browder chart, used for percentage of burn calculation. Previous studies showed prolonged ED (Emergency department) stay<sup>6</sup>, diabetes mellitus<sup>7</sup>, raised leukocyte count<sup>8</sup>, multiple comorbid factors, Advanced age<sup>9</sup>, class C liver cirrhosis, ascites<sup>10</sup>, higher serum creatinine, lower hemoglobin and platelet levels<sup>10</sup> are associated prognostic factors regarding mortality in necrotizing fasciitis. The late diagnosis occurs frequently in diabetics, immunosuppressed, intravenous drug abusers and patients with peripheral vascular disease. Common sites of involvement are perineum, extremities and abdomen in order. In this study, we were particularly interested in body surface area involvement in necrotizing fasciitis that determines the outcome of patients with necrotizing fasciitis. The mortality rate of Necrotizing fasciitis remains high (ranging from 6% to 76%) despite advancement of modern medical care<sup>11,12,13</sup>. As such no single factor can be considered as a determinant of mortality in necrotizing fasciitis, however we have tried to find relation of body surface area with mortality.

**MATERIAL AND METHODS**

This was a prospective study conducted at Government medical college, Nagpur over a period of two years from March 2008 to May 2010. This included all the patients diagnosed as necrotizing fasciitis and admitted through the emergency department. The patients below 12 years of age were excluded from the study. After resuscitation in emergency room, the patients underwent emergency debridement. All necrosed tissue and slough was removed. Wound was irrigated with normal saline and hydrogen peroxide. The post operative treatment included correction of fluid and electrolytes balance, daily dressings and nutritional supplementation., initially intravenous antibiotics (Metronidazole and Crystalline penicillin) were started, higher antibiotics (IV Cefotaxim, Piperacillin with tazobactam etc.) were changed later according to the culture sensitivity results. The patients requiring post operative specialized services (e.g. skin grafting) were referred to respective specialties (e.g. plastic surgery unit). Later, the patients were followed up in out patients department. Data was collected with special reference to clinical features, investigations, comorbidities, involved site, percentage of body surface area involved using following Lund And Browder chart use to calculate % of burns, surgical intervention, outcome and follow up. The outcome measure was in-hospital mortality.

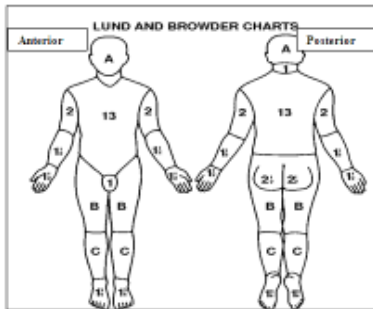


Figure 1:

Patients were divided into 3 groups less than 10% body surface area involved, in between 10-20% and more than 20 %. Student *t* test were used to determine whether the between- group differences were statistically significant ( $P < 0.05$ ).

The analysis was performed with SPSS 9.0 (SPSS, Inc, Chicago, IL). computer software.

**RESULTS**

Overall 64 patients were enrolled in the study. These include 56 male and 8 female patients. The mean age was 48 years with the range of 16–89 years. Clinical manifestations include redness, swelling, burst abscess, pain, fever, itching, skin necrosis and foul smelling

discharge, blister and ulcer, bullae and crepitus and shock. The data of patients with respective surface area involved due to necrotizing fasciitis is as follows:

Table 1:

Percentage of body surface area	No. of patients	Percentage of patients
0 - 5	22	34.375
5-10	19	29.6875
10-15	10	15.625
15-20	9	14.0625
20-25	3	4.6875
> 25	1	1.5625
<b>Total</b>	<b>64</b>	<b>100</b>

Most of the patients had involvement of less than 10% body surface area. The percentage of survivors and non survivors with respect to the body surface involvement are as follows:

Table 2:

Percentage of body surface area	(No. of patients) NONSURVIVOR%	(No. of patients) SURVIVOR%
<10	(5) 35.71	(36) 72
11-20	(6) 42.85	(13) 26
>20	(3) 21.42	(1) 2
<b>Total</b>	<b>(14) 100</b>	<b>(50) 100</b>

As the percentage of body surface area involvement is increased the mortality increased significantly. Student *t* test were used to determine whether the between group differences were statistically significant ( $P < 0.05$ ). Comparison of % area involved in Non survivors and Survivors.

Table 3:

Group	No of pt.	Mean	SD	SEM	t	P	Result
Non survivors	14	.1536	8.130	2.173	3.5	0.0	Sig
Survivors	50	8.840	5.479	7.748			
		E-02	E-02	E-03			

There is significant correlation found between involved surface area by Necrotizing fasciitis with mortality. With increase in body surface area involvement there is increase chances of mortality.

**DISCUSSION**

Necrotizing soft tissue infections has been associated with a wide range of mortality rates (6% to 76%)<sup>11,12,13</sup>. They were as high as 80% since Meleny’s time i.e. 1927<sup>14</sup>. The paucity of definite clinical features leading to a low diagnostic accuracy in the background of the polymicrobial nature of the infection with rapid progression to fulminant sepsis has contributed to this.

However, high index of suspicion, wider range of antibiotics, newer methods of dressings and better intensive care facilities have all contributed to a decrease in the mortality rate to 20% to 30% as reported in the latest literature. Percentage of body surface area involved was among one of the factors significantly affecting mortality. This is not consistent with some studies, however, the percentage of area involved is related to the amount of sepsis and time between onset and presentation<sup>15,17</sup>. Involvement of large surface area is seen when a patient is treated for a longer interval from the onset of the disease (as treated with home remedy and traditional medicines, treated by quacks,) or is conserved initially due to misdiagnosis. This allows the infection and necrosis to spread to adjacent areas. Thus increased body surface area suggests advanced disease. Clayton *et al* (1990)<sup>15</sup> found no survival advantage in patients with localized compared with extensive infection. In other

series the authors found that those with less than 5% surface area of involvement, calculated using the modified burns assessment criteria described in this article, had a higher likelihood of survival<sup>16</sup>. Yilmazlar T *et al*<sup>17</sup> reported dissemination of infection to be significant factor affecting mortality on multivariate analysis in their study of 91 patients. In this study there is significant linear correlation found between involved surface area by Necrotizing fasciitis with mortality. With increase in body surface area involvement there is increase chances of mortality. In present study the mortality is also correlated with the comorbid condition/s like presence of Diabetes Mellitus, pneumonia, etc., as well as general condition at the time of presentation, like Shock (hypotension), mental obtundation, oliguria, raised Serum Creatinine. Many authors after their study on necrotizing fasciitis have found various different factors associated with mortality.

Table 3:

Study	No. of patients	Significant factors
McHenry <i>et al</i> 1995 <sup>18</sup>	65	Time between onset and debridement, immunocompromised state, more than 1 comorbidity.
Yang-Meng Liu <i>et al</i> 2005 <sup>19</sup>	87	More than 1 comorbidity, anemia, thrombocytopenia, > 24 hours delay from onset of symptoms to surgery, age > 60 years
Tiu, Martin <i>et al</i> 2005 <sup>7</sup>	48	Delay in surgical intervention, diabetes mellitus
Cheng-Ting Hsiao 2008 <sup>8</sup>	128	Aeromonas infection, Vibrio infection, cancer, and band form white blood cell count greater than 10%, bullae – negative predictor
Wong, Chang <i>et al</i> 2003 <sup>14</sup>	89	Delay for surgery > 24 hrs
Golger <i>et al</i> 2007 <sup>20</sup>	99	Advanced age, streptococcal toxic shock syndrome, immunocompromised status
ChengNC <i>et al</i> 2008 <sup>21</sup>	14	Altered sensorium, respiratory distress
Bair MG <i>et al</i> 2009 <sup>10</sup>	91	Advanced age, class C liver cirrhosis, ascites, higher serum creatinine, and lower, hemoglobin and platelet levels
Dworkin MS <i>et al</i> 2009 <sup>9</sup>	80	Young age, old age, evidence of underlying comorbid conditions, evidence of sepsis
Present study	64	Percentage of body surface area involved, Shock (hypotension), mental obtundation, oliguria, Diabetes Mellitus, Serum Creatinine

The gold standard for detecting necrotising soft tissue infections is tissue biopsy obtained at the time of wound exploration and surgical debridement.<sup>22</sup> During wound exploration, tissue integrity and depth of invasion can also be evaluated. Presence of fascial necrosis and myonecrosis are indicative of necrotizing infection. Loss of fascial integrity along tissue planes and frank evidence of muscle involvement are also diagnostic.<sup>22</sup> A bedside procedure that aids diagnosis is the 'finger test'. A 2-cm incision down to the deep fascia is made under local anaesthesia, and the level of the superficial fascia is then probed with a gloved finger. Lack of bleeding, foul-smelling 'dishwater' pus, and minimal tissue resistance to finger dissection indicate a positive finger test,<sup>23,24</sup> and are considered diagnostic of necrotising fasciitis. In necrotising fasciitis, the operative findings include the presence of dusky gray subcutaneous fat and fascia with a scanty serosanguineous discharge.<sup>24</sup> Also there is a lack

of resistance to blunt dissection of the normally adherent superficial fascia, accompanied by a lack of bleeding and the presence of foul-smelling 'dishwater' pus.<sup>23</sup> Surgical diagnosis also involves examination of frozen sections after exploration of suspect areas to look for neutrophil infiltrates at wound margins. Regardless of the stage of disease presentation, the treatment of this condition requires multidisciplinary, aggressive treatment, involving resuscitation, blood pressure support, and early intensive care. Broad-spectrum antibiotics covering gram-positive, gram-negative and anaerobic bacteria should be initiated early. Antimicrobial therapy should then be appropriately tailored to culture and susceptibility results.<sup>25</sup>

## CONCLUSION

Necrotizing fasciitis is a potentially life threatening emergency conditions and carries mortality of 22% in

present study. Body surface area involvement can be used as a predictive indicator for mortality along with other mortality indicators in Necrotizing fasciitis. Early diagnosis and prompt surgical intervention are considered to be critical in order to obtain an improved survival.

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