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Case Report

Necrotizing Fasciitis Following Trauma and Surgery: Early Recognition and Aggressive Management in Four Uncommon Cases

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Abstract

Background: *Necrotizing fasciitis (NF) is a rapidly progressive, life-threatening soft-tissue infection associated with high morbidity and mortality despite advances in critical care and antimicrobial therapy. Early diagnosis remains challenging due to atypical presentations, particularly following trauma or surgical procedures.*

Methods: We *present a small case series of four patients who developed necrotizing fasciitis following trauma or surgical intervention. Clinical presentation, diagnostic workup, Laboratory Risk Indicator for Necrotizing Fasciitis (LRINEC) score, management strategies, and outcomes were analysed. All patients underwent aggressive surgical debridement, broad-spectrum antibiotics, and multidisciplinary care.*

Results: *Four patients aged 18–30 years developed necrotizing fasciitis following polytrauma (n=2), minor trauma (n=1), and postoperative clavicle fixation (n=1). LRINEC scores ranged from 7 to 9, indicating moderate to high risk. All patients underwent urgent radical debridement with repeated procedures until healthy tissue was achieved. Split-thickness skin grafting was performed for definitive wound coverage. All patients survived with complete wound healing and satisfactory functional outcomes.*

Conclusion: *Necrotizing fasciitis can occur following minor trauma or routine orthopaedic procedures even in healthy individuals. Early clinical suspicion, prompt surgical intervention, repeated debridement, and multidisciplinary management are critical for limb salvage and survival.*

Keywords: Necrotizing fasciitis, Orthopaedic infection, LRINEC score, Surgical emergency, Postoperative infection, Trauma

1. Introduction

Necrotizing fasciitis (NF) is a fulminant soft-tissue infection characterized by rapidly progressive necrosis of fascia and subcutaneous tissue, often associated with systemic toxicity and septic shock. Despite advances in antimicrobial therapy and intensive care, NF continues to carry high mortality rates ranging from 20% to 50% particularly when diagnosis and surgical intervention are delayed [1,2].

The condition may arise following minor trauma, surgical procedures, or systemic illness, but can also occur in previously healthy individuals [3,4]. Postoperative necrotizing fasciitis, especially following orthopaedic procedures such as clavicle fracture fixation, is exceptionally rare but represents a catastrophic complication requiring immediate recognition and aggressive treatment [5,6].

This case series highlights uncommon presentations of necrotizing fasciitis following trauma and surgery, emphasizing early clinical suspicion, prompt diagnosis, aggressive surgical management, and multidisciplinary care in achieving favourable outcomes.

We present a small series of four cases of necrotizing fasciitis, diagnosed early by suspicion and treated extensively and aggressively. The inclusion criteria consisted of patients who developed NF after traumatic injury or surgical intervention. For all cases, the LRINEC (Laboratory Risk Indicator for

Necrotizing Fasciitis) score to assess the severity and predict the risk of mortality.

1.1. Severity Scores (New Section)

Each patient was evaluated using the severity score, which is essential in determining the extent of tissue involvement and guiding therapeutic interventions. The severity score was based on the clinical assessment, laboratory findings, and imaging results, including:

For each case, the severity of the infection was graded on a scale from mild to severe based on these factors, with detailed results provided in the case descriptions.

Upon clinical suspicion of necrotizing fasciitis, a complete diagnostic workup for each patient was prepared. This included:

1.1.1. Clinical examination

Prompt assessment for signs of sepsis, systemic toxicity, and the characteristic features of necrotizing infections, such as rapid spreading erythema, fluctuance, and crepitus.

1.1.2. Laboratory Investigations

- Blood cultures: Collected immediately upon admission to identify the causative microorganisms.
- Complete blood count (CBC): Elevated white blood cell count was observed in all cases.
- C-reactive protein (CRP): Markedly elevated in each case, supporting the diagnosis of a severe inflammatory response.
- Electrolytes and renal function tests: To monitor for renal failure, which is a common complication in severe cases of NF.
- Culture Results

1.1.3. Imaging Studies

CT scan and/or MRI: Performed in all cases to assess the extent of tissue involvement. CT scans revealed the presence of gas within the tissues in two of the cases, which supported the diagnosis of necrotizing fasciitis.

1.2. LRINEC Score (Revised Section)

The LRINEC (Laboratory Risk Indicator for Necrotizing Fasciitis) score is a clinical tool developed to help distinguish necrotizing fasciitis from other severe soft tissue infections. It evaluates six laboratory variables:

- **C-reactive protein (CRP):** ≥150 mg/L (4 points)
- **WBC Count:** <15 (0), 15–25 (1), >25 (2) (103/mm3)
- **Haemoglobin:** >13.5 (0), 11–13.5 (1), <11 (2) (g/dL)
- **Sodium:** <135 mmol/L (2 points)
- **Creatinine:** >141 umol/L / 1.6 mg/Dl (2 points)
- **Glucose:** >10 mmol/L / 180 mg/dL (1 point)

A total score of ≥6 is considered a red flag for necrotizing fasciitis, while ≥8 indicates a very high risk. These scores were instrumental in guiding our management decisions, including early surgical intervention and the use of broad-spectrum antibiotics.

Sr no	Details	Case i	Case ii	Case iii	Case iv
1	Diagnosis	Polytrauma - # PELVIS	Polytrauma knee ACL injury	Minor knee abrasion	Fracture clavicle
2	Primary treatment	Ex fix pelvis	ACL reconstruction	Dressing antibiotics	ORIF plating
3.	Area involved	Back sacral area - # pelvis	Left thigh lateral	Left knee all around	Shoulder & clavicle area
4.	Size	15cm*10cm	15cm*12cm	35cm*26cm	20cm*16cm
5.	Hb	10.5gm - 2	11.3 GM 2	10gm-2	11.7gm - 1
	Tc	17500 - 1	22800 2	26800 -2	18600 - 1
	CRP	95 – 2	120 3	145 - 3	140 - 3
	Sodium	135	136	136	134
	Creatinine	1.65 2	1.80 2	1.67 -2	1,7 - 2
	Glucose	138mg/dl -0	128MG/DL	118mg/dl-0	124mg/dl -0
	LRINEC Score	7	9	8	7
6	*Surgical treatment*	*Radical excision necrectomy repeated – STG*	*Radical excision necrectomy repeated – STG*	*Radical excision necrectomy repeated – STG*	*ROI – radical excision debridement – skin coverage*
7	*Pus culture*	*Staphylococcus aureus (methicillin-resistant)*	*Staphylococcus aureus (methicillin-resistant)*	*Escherichia coli and Pseudomonas aeruginosa*	*Clostridium perfringens*
8	HPE /biopsy	Suggestive of NF	Changes of NF	Changes of NF	Changes of NF

9	Hospitalisation period	28 days	32 days	41 days	38 days
10	End result	Healed – 44 days	Healed - 47 days	Healed – 49 days	Healed – 55 days
11	Mortality	Survival	Survival	Survival	Survival

1.3. Management Protocol

All patients were managed using a standardized aggressive protocol:

• Immediate surgical exploration upon suspicion of necrotizing fasciitis - Early radical debridement including at least 2 inches of normal tissue above necrotic area all around all sides was performed in all cases, with tissue excision repeated until healthy tissue was encountered.

• For Case, III a clavicle plate exposure was noted during the debridement, which was managed by removal of plate with extensive debridement was done in emergency. This was followed by repeated debridement mucosectomy till healthy granulation tissue come up and covering it with a split thickness graft to ensure coverage and prevent infection.

• Radical en bloc debridement of all necrotic tissue

• Repeated debridement as many times as required almost daily was done

• Broad-spectrum intravenous antibiotics, including coverage for MRSA and anaerobes

• Hemodynamic stabilization and intensive care support

• Definitive wound management with advanced dressings and skin grafting where indicated

1.3.1. Wound Coverage

• Case 1: (Pelvic Injury) A split-thickness skin graft was applied after debridement, with successful graft take after two weeks.

• Case 2: (Knee Injury ACL) A split skin graft was used to cover the exposed sacral region after ensuring that no further infection was present.

• Case 3: (Minor knee injury) A combination of split-thickness graft and local flaps was used, with a gradual return to normal function after six months.

• Case 4: (# clavicle ORIF done) A combination of split-thickness graft and postage stamps was used, with a gradual return to normal function after three months.

1.3.2. Antibiotic Therapy

All patients received broad-spectrum intravenous antibiotics upon admission, with adjustments made based on culture sensitivities.

Follow-up and Outcomes (Revised)

Patients were followed up at 1, 3, and 6 months post-surgery. We monitored for:

• Signs of recurrent infection

• Graft failure

• Functional outcomes, especially in terms of mobility and the ability to resume normal activities

At the 6-month follow-up, all patients had healed successfully with no recurrence of infection. The wounds were well-covered with grafts, and there was no significant loss of function.

2. Case Series

2.1. Case 1: Necrotizing Fasciitis Following Polytrauma (Sacral pelvis #)

An 18-year-old female presented following high-energy polytrauma with pelvic instability, knee ligamentous injury and multiple injuries. She underwent initial stabilization and orthopaedic management External fixation for pelvis #. Within 7 days of admission, she developed severe pain in the sacral and gluteal region, disproportionate to local skin findings, associated with fever, tachycardia, and systemic toxicity.

Clinical examination revealed rapidly progressive skin discoloration necrosis, oedema, and tenderness over the sacral and gluteal area. Surgical exploration revealed extensive necrosis of skin, subcutaneous tissue, and fascia consistent with necrotizing fasciitis. Immediate radical en bloc debridement was performed, removing all devitalized tissue. Multiple repeat debridement was required.

Serial photographs demonstrated extensive tissue loss initially, followed by healthy granulation tissue formation and progressive wound healing. The patient ultimately achieved complete wound healing with advanced wound care and recovered without residual infection.

Figure 1: Necrotizing Fasciitis Following Polytrauma (Sacral pelvis #) Raw area after radical necrectomy, healed wound after STG, preop x ray, clinical picture with Ex fix and follow up x ray 3 months post op

2.2. Case 2: Necrotizing Fasciitis Following Knee injury ACL)

A 22-year-old female presented following high-energy polytrauma with knee ligamentous injury and multiple injuries. She underwent initial stabilization and orthopaedic management Knee arthroscopy and ACL ligamentous repair. Within 7 days of admission, she developed severe pain in the lateral side of thigh region, disproportionate to local skin findings in the form of ulcer with rapid necrosis blackening of margins, associated with fever, tachycardia, and systemic toxicity.

Clinical examination revealed rapidly progressive skin discoloration necrosis, oedema, and tenderness over the lateral aspect of lower thigh. immediate suspicion, clinical diagnosis was followed by Surgical exploration revealed extensive necrosis of skin, subcutaneous tissue, and fascia consistent with necrotizing fasciitis. Immediate radical en bloc debridement was performed, removing all devitalized tissue. Multiple repeat debridement was required.

Serial photographs demonstrated extensive tissue loss initially, followed by healthy granulation tissue formation and progressive wound healing. The patient ultimately achieved complete wound healing with advanced wound care by vaccume therapy followed by split thickness grafting and recovered without residual infection. Wound healed with full function at the end of 90 days.

Figure 2: Necrotizing Fasciitis Following Knee Injury (ACL) after Necrectomy Healthy Area and Final STG Taken Up. Post op x ray ACL Reconstruction

2.3. Case 3: Necrotizing Fasciitis of the Knee Following Minor Trauma

A 30-year-old female with no significant comorbidities sustained a minor abrasion over the left knee. which was treated conservatively. After 1 week of injury, she subsequently developed rapidly worsening pain, swelling, erythema, and skin discoloration around the knee, accompanied by fever and systemic signs of infection. Examination revealed black eschar, slough, surrounding erythema, and tense oedematous skin. Pain was severe and disproportionate to clinical findings. Urgent surgical exploration confirmed necrotizing fasciitis with extensive soft tissue necrosis.

Figure 3: Necrotizing Fasciitis of the Knee Following Minor Trauma – Initial Clinical Picture with Progressive Lesion in Few Hours

Wide radical debridement and necrectomy were performed, followed by repeated debridement and broad-spectrum intravenous antibiotics. After one months of intensive wound management, the wound bed was clean and healthy, and split-thickness skin grafting was performed. The graft healed well, and at three months the patient had full functional recovery, was able to walk, squat, and sit cross-legged without pain or limitation.

Figure 4: Necrotizing Fasciitis of the Knee healing Raw Area Clinical Picture Followed by STG with Final Functional Cosmetic Result
https://youtu.be/WRSI2zyvss8?si=xALycO1ApVCaD3CP

2.4. Case 4: Postoperative Necrotizing Fasciitis Following Clavicle Open Reduction and Internal Fixation

A 24-year-old male underwent open reduction and internal fixation with plating for a clavicle fracture. On the fourth postoperative day, he developed severe pain at the surgical site, rapidly progressive swelling, erythema, and systemic toxicity.

Initially resembling a superficial surgical site infection, the pain was markedly disproportionate to local findings. The wound rapidly progressed to skin discoloration, necrosis, and deep tissue involvement. Imaging suggested deep soft tissue infection.

Urgent surgical exploration revealed necrotizing fasciitis involving the subcutaneous tissue and fascia around the clavicle. Aggressive radical debridement was performed, and broad-spectrum intravenous antibiotics covering gram-positive, gram-negative, and anaerobic organisms were initiated.

Repeated debridement and intensive care support resulted in infection control and wound healing. The patient recovered fully without further complications. This case highlights an extremely rare but catastrophic complication following clavicle fracture fixation.

Figure 5: Postoperative Progressive Necrotizing Fasciitis Following Clavicle Open Reduction and Internal Fixation

2.4.1. Comparison with Published Literature (J Orthop Case Rep. 2021;11(4):17-21)

Postoperative necrotizing fasciitis following clavicle fixation is rare but life-threatening. Surgical site infection rates after clavicle fixation range from 0.4% to 7.8%, with progression to necrotizing fasciitis being extremely uncommon [6]. Similar to previously reported cases, our patient developed rapid deterioration on postoperative day four, requiring emergency debridement. Early surgical intervention and aggressive treatment led to successful recovery in our patient, consistent with previously published reports [1,2,6].

2.4.2. Comparison of Published Case Series and Present Study

Several studies have reported significant mortality in necrotizing fasciitis. McHenry et al. reported 65 patients with 21.9% mortality, while Elliott et al. described 198 patients with 22.7% mortality. Wong et al., in the original LRINEC study, reported 89 patients with approximately 20% mortality [3-5]. Anaya and Dellinger reported mortality rates ranging from 15% to 25% across multiple series [2]. In contrast, our case series of four patients demonstrated zero mortality, which may be attributed to early clinical suspicion, prompt diagnosis, aggressive radical debridement, repeated surgical intervention, and multidisciplinary care [7].

3. Discussion

Necrotizing fasciitis is a surgical emergency in which early recognition and immediate operative intervention remain the most important determinants of survival [1,2]. Pain out of proportion to clinical findings is considered the most reliable early indicator of necrotizing fasciitis [3]. Imaging studies such as CT and MRI may assist in diagnosis but should never delay surgical exploration [4].

Postoperative necrotizing fasciitis following clavicle fixation is extremely rare. Surgical site infections following clavicle fixation occur in approximately 0.4–7.8%, with necrotizing fasciitis representing a catastrophic but rare progression [6]. Surgeons must maintain a high index of suspicion when

postoperative wounds deteriorate rapidly or fail to respond to conventional therapy [8].

The LRINEC score has been widely used to aid in early diagnosis and risk stratification of necrotizing fasciitis [3]. In our series, all patients demonstrated moderate to high risk scores, supporting early surgical intervention.

Aggressive surgical debridement, broad-spectrum antibiotics, and intensive supportive care remain the cornerstone of treatment [1,2,5]. Multiple debridement is often necessary until healthy bleeding tissue is achieved. Early wound coverage using split-thickness skin grafts helps reduce morbidity and hospital stay.

This case series demonstrates that necrotizing fasciitis may occur following minor trauma or routine orthopaedic procedures, even in otherwise healthy individuals. Early diagnosis and aggressive treatment resulted in limb salvage and survival in all cases.

4. Conclusion

Necrotizing fasciitis remains a life-threatening surgical emergency requiring early recognition and aggressive management. This case series highlights that necrotizing fasciitis can occur following minor trauma or routine orthopaedic surgery. The use of LRINEC scoring, early diagnosis, prompt radical debridement, repeated surgical intervention, and multidisciplinary management are essential for successful outcomes as life and limb salvage.

Declarations

Ethical Approval and Consent:

Written informed consent was obtained from all patients for publication of clinical details and images. Patient anonymity has been maintained.

Conflict of Interest:

None declared.

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Author Contributions:

All authors contributed to patient management, data collection, manuscript preparation, and final approval.

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