

Synergistic Gangrene of Abdominal Wall: Our experience at Mayo Hospital, Lahore

Y MOHAMMAD M AHMED K M GONDAL A R GURAYA SAKHTAR A M CHAUDHRY.

Department of Surgery, Mayo Hospital, Lahore,

Correspondence to Dr. Yar Muhammad

In this study 15 patients were selected (out of 920), who developed synergistic gangrene of abdominal wall. They were operated in emergency from July 1997 to June 2001. The most common cause of development of synergistic gangrene was colorectal injury in 11(73.4%) patients due to penetrating wounds. Gangrene developed from the site of penetrating wound. Less common causes include peritonitis in 2(13%) patients, perineal injury one patient (6.6%), criminal abortion one patient (6.6%). Five patients were diabetic. In addition to the general supportive measures, wound debridement was the main basis of treatment. The synergistic gangrene should be prevented by initial wound debridement, if it develops, it has high morbidity and mortality.

Key words: Synergistic gangrene, abdominal wall, debridement

Meleny in 1924 described a form of the disease and termed it 'streptococcus gangrene'^{1,2} and Wilson, in 1952, used the term necrotizing fasciitis³. Other terms used for this disease are synergistic necrotizing cellulitis, progressive bacterial gangrene^{3,5}. It is a cutaneous gangrene due to synergistic infection with the microaerophilic non haemolytic streptococci and usually, *Staphylococcus Aureus* but other organisms like *E. Coli*, *Bacteroides*, *Klebsiella* etc., may also be involved. This disease process affects all ages and both sexes both in females it is less than males, and the incidence of disease increases with age. It is rare, and usually follows exploratory laparotomy for peritonitis or colonic surgery for trauma, operative drainage of abscess, drainage of empyema of thorax. Diabetic patients are more prone to develop the gangrene⁴. It starts as brilliant red colour which changes to purple which subsequently becomes black with the onset of gangrene.

The synergistic activities of polymicrobials inflict devastating necrotising fasciitis on the hapless patients. Polymicrobial cultures of aerobes and anaerobes are the rule rather than exception⁶. In the case of synergism one bacterium produces a nutrient for another, which enters, produces a leukocidal toxin. This toxin then protects both organisms from phagocytosis. Moreover, the aerobes by decreasing oxygen tension produces favourable atmosphere for the anaerobes. Infective focus may arise from the local skin, urinary tract (stones, renal abscess, urethral strictures) and colorectal region (perforated appendicitis, colonic carcinomas and colonic injuries).

There is thrombosis of the small subcutaneous vessels and with infection results in the development of gangrene of the overlying skin. Deeper extension may cause myonecrosis, but it is not generally considered to be teacher of classic disease⁷. The extent of disease is quite variable. By the only small patch up abdominal skin may be gangrenous, the whole abdominal wall may slough off.

The management includes resuscitation with the intravenous fluids and/or blood transfusion as required. The finding of a mixture of organisms has led to the

treatment with multiple antimicrobial agents covering aerobes, anaerobes and gram negatives organisms. The antibiotic regime must have high degree of effectiveness against these organisms. Parenteral hyperalimentation may be required, but enteral feeding is preferred and is usually sufficient for positive nitrogen balance. Surgical debridement remains most successful mode of treatment, while the antimicrobial agents are essential to control the multiplication and spread of organisms, proper debridement of necrotic tissues, the nidus of infective process, remains the basis of management. Debridement of necrotic tissue may be repeated if necessary.

Patients and methods

In this study we reviewed all the patients who underwent exploratory laparotomy for penetrating abdominal trauma or peritonitis from July 1997 to June 2001. Fifteen patients who developed synergistic gangrene of abdominal wall were included in the study to identify the factors leading to this dreadful disease. Patients below the 12 years of age were excluded from this study as they are treated in Paediatric Surgery Department. The patients were investigated to diagnose comorbid factors like diabetes mellitus. As well as condition of the patient at operation i.e., hypovolaemia, type of trauma and severity of peritonitis, operative procedure, wound closure, wound debridement etc., were also noted. Diagnosis was made on clinical assessment of the patients. Routine blood C/E, blood urea, blood sugar, serum electrolyte, and complete urine examination were done.

Tissue and pus from the affected area was taken and sent for culture sensitivity. All the patients were already on antibiotic for treatment of their original disease process except one who was diabetic. This patient was started with empirical antibiotics through the report of culture sensitivity was available. The patients who were diabetic they were given insulin to control the diabetes mellitus.

In addition to antibiotics, wound debridement was done in all the patients. single debridement done on 11 patients and twice on 4 patients.

General supportive measures including analgesia fluid electrolyte, nutrition, dressing etc., were used in all the patients.



Fig. Results after debridement of Synergistic gangrene at exit wound of firearm injury.

Results

Out of 920 patients who underwent abdominal operations in Emergency Department 15(1.6%) patients developed synergistic gangrene of the abdominal wall (Table 1).

Table 1 The aetiological factors of synergistic gangrene.

Predisposing/Underlying cause	Sex		=n	%age
	Male	Female		
Colorectal injuries	10	1	11	73.3
Peritonitis	1	1	2	13.2
Perineal injury	1	-	1	6.6
Criminal abortion	-	1	1	6.6

Most common cause was injury due to firearm in 10 patients and stab in one patient. There was colorectal injury in all these patients in addition to other viscera which are small gut (6 patients), liver (2 patients) stomach (2 patients), pancreas (3 patients), spleen (1 patient). Only one patient had isolated colonic injury on left side. All those patients with firearm injury who developed gangrene, had the gangrene at the exit wounds. This is due to contamination of the exit wound by the colonic organisms. None had gangrene on the entry wound. Two patients (13.2%) had peritonitis. One due to perforated appendicitis and other due to perforated duodenal ulcer. Both of these underwent exploratory laparotomy. One patient (6.6%) had perineal injury and one (6.6%) had intervention by 'dai' for criminal abortion. Both of these developed the gangrene, starting from the inguinal region and then spreading upwards. The patients developed the synergistic gangrene of the abdominal wall between 3rd and 5th postoperative day. Five patients were diabetic and they developed more severe disease involving whole of the abdominal wall.

According to culture & sensitivity reports (Table 2) all the patients had polymicrobial infection, the most common organisms being microaerophilic non haemolytic streptococcus in 15(100%) patients. Staphylococcus aureus was present in 14(92.4%) patients. Other less common organisms include bacteroides in 8(52.8%), E. Coli 6(39.6%), Klebsiella sp.5(33%). Four (26.4%)

patients died. These patients were diabetic and also had a severe form of the disease.

Table 2. Causative organisms as determined by culture reports.

Name of organisms	n=	%age
Microaerophilic streptococcus	15	100
Staphylococcus aureus	14	92.4
Bacteroides	8	52.8
E. Coli	6	39.6
Klebsiella	5	33

Discussion

The synergistic gangrene of abdominal wall is because of polymicrobial organisms^{1,6}. The most common aetiological factor in the study was colorectal injury leading to contamination of the wound by the colonic organisms. The synergistic action of these organisms along with the skin commensals (Staph. aureus) produces causes infective gangrene of the abdominal wall^{9,11}. The less common causes include peritonitis perineal injury and obstetric injury because of criminal abortion⁷. The offending organisms are microaerophilic nonhaemolytic streptococci and Staph. Aureus. The less common organisms are E Coli Klebsiella and bacteroides. The wound debridement should be done as early as possible after the onset of infection⁸.

Some systemic conditions are frequently encountered in association with synergistic gangrene to suggest a causal relationship. Diabetes mellitus has been so frequently mentioned as an associate in the aetiology of necrotizing fasciitis, that is time to accord it a full status in the aetiology of this dreadful disease¹⁰. Other factors which predispose to this dreadful condition are renal failure, liver failure and immunodeficiency.

The multiplicity of organisms of synergistic gangrene suggests that none of them can properly be regarded as the cause of the disease. These organisms are usually commensals and so they are opportunistic in addition to their synergistic activity. Skin should be considered as source of infection when other sources like e.g., urological, colorectal have been excluded. Its diagnosis is a clinical matter. The application of investigations Some investigations which are done are blood examination, blood urea, blood sugar, urine examination, liver function test and culture sensitivity of the tissues/pus from the infected site.

Treatment of synergistic gangrene needs to be prompt, pragmatic and individualized Conservative treatment without surgery may suffice but rarely. Catheterization and colostomy are beneficial when indicated and when judiciously employed. Hyperbaric oxygen is also an adjunct in the treatment of synergistic gangrene^{3,8} Antimicrobial agents should be an adjunct to surgical elimination of the nidus of sepsis. In view of the usual polybacterial cultures, triple antimicrobial therapy is justified.. Surgical excision to rid the patient promptly of fetid necrotic tissue and rapid extension of gangrene, along with the treatment of predisposing conditions, is essential.

Radical excision including healthy tissues, as advocated by some, should be avoided, as it is likely to sacrifice tissue needlessly. It should be appreciated that, as the pathological process is rapid and ongoing at the time of a debridement, identification of all critically ischaemic tissue at any single session of excision may be impossible. Wound debridement should be adequate and if needed it can be repeated. If the surgical defect is large it can be closed.

Conclusion

The diagnosis of synergistic gangrene of abdominal wall (Meleney gangrene) is clinical. It should be prevented by wound debridement of the abdominal wall at the entry & exit wounds of firearm injuries respectively. In addition to general measures, main treatment of gangrene involved prompt extirpation of all nonviable tissues, limitation and abolition of any infective process and occasional anatomical reconstruction.

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