

CHARACTERISTIC AND MANAGEMENT FOURNIER'S GANGRENE AT ARIFIN ACHMAD REGIONAL GENERAL HOSPITAL OF RIAU PROVINCE

¹Zuhirman Zamzami, ¹Indra Jaya, ¹Muhammad Adan Yashar, ²Maria Zalena.

¹Division of Urology/Department of Surgery, Faculty of Medicine/Riau University, Arifin Achmad Regional General Hospital, Pekanbaru Riau.

²Faculty of Medicine/Riau University, Pekanbaru Riau.

ABSTRACT

Objective: To evaluate the characteristic and the management of Fournier's gangrene. **Material & Methods:** We reviewed medical records of Fournier's gangrene patients including age, etiology, invasion of bacteria, underlying disorders, clinical symptom, radiology and laboratory findings, management, and complication in Arifin Achmad General Hospital, Pekanbaru, Riau Province, in January 2012–December 2017. Statistical analysis of univariate was used. Approval of the study was obtained from the Ethical Review Board for Medicine and Health Research, Medical Faculty, University of Riau. **Results:** There were 19 patients in the study. The result showed that Fournier's gangrene cases occurred mostly in age 56-65 year old age group in 8 (42.1%) patients. The etiology was from urogenital cause in 15 (78.9%) patients. Most invasion bacteria was *Acinetobacter baumannii* in 5 (26.3%) patients. The most underlying disorder was elderly age in 10 (52.6%) patients. The most frequent symptom was puss on the scrotal in 10 (52.6%) patients. The most laboratory examination was puss bacterial culture in 14 (73.7%) patients. The most frequent treatment for Fournier's gangrene was initial and preoperative management in 19 (100%) patients. The acute complication of Fournier's gangrene was sepsis in 5 (26.3%) patients. **Conclusion:** Fournier's gangrene occurred mostly in elderly age in which *Acinetobacter baumannii* was the most invasion bacteria and sepsis was the most complication.

Keywords: Elderly age, puss in the scrotum, urogenital.

ABSTRAK

Tujuan: Mengetahui gambaran karakteristik dan penatalaksanaan Fournier's gangrene. **Bahan & Cara:** Kami melihat kembali semua rekam medis pasien Fournier's gangrene yang dirawat dan ditatalaksana di RSUD Arifin Achmad, Pekanbaru, Provinsi Riau pada January 2012–Desember 2017 berdasarkan usia, etiologi, invasi bakteri, faktor predisposisi, gejala klinis, pemeriksaan penunjang, penatalaksanaan, serta komplikasi. **Hasil:** Terdapat 19 pasien Fournier's gangrene yang sering terjadi pada kelompok usia 56-65 tahun pada 8 (42.1%) pasien. Penyebab terbanyak berasal dari penyakit urogenitalia pada 15 (78.9%) pasien. Invasi bakteri terbanyak adalah *Acinetobacter baumannii* pada 5 (26.5%) pasien. Faktor predisposisi terbanyak adalah usia tua pada 10 (52.6%) pasien. Keluhan yang paling sering adalah nanah pada skrotum pada 10 (52.6%) pasien. Pemeriksaan penunjang yang sering dilakukan adalah kultur nanah pada 14 (73.7%) pasien. Penatalaksanaan terbanyak adalah terapi awal dan preoperatif pada 19 (100%) pasien. Komplikasi terbanyak yaitu komplikasi sepsis pada 5 (26.3%) pasien. **Simpulan:** Fournier's gangrene sering terjadi pada usia tua dimana *Acinetobacter baumannii* merupakan bakteri yang paling menyerang dan sepsis paling komplikasi.

Kata Kunci: Usia tua, nanah pada skrotum, urogenitalia.

Correspondence: Zuhirman Zamzami; c/o: Division of Urology/Department of Surgery, Faculty of Medicine/Riau University, Arifin Achmad General Hospital, Pekanbaru Riau. Jl. Diponegoro No. 1-2, Pekanbaru 28133, Riau. Phone: +620761854732; Fax: +62076139930. Mobile phone: 08127549988. Email: zuhirman.zamzami@yahoo.com.

INTRODUCTION

Fournier's gangrene disease is a form of necrotizing fasciitis found around the male external genital (penis, scrotum) and perineum. This disease

is an emergency in the field of urology because it appears very suddenly, quickly developed large gangrene formation, and result in septicemia.¹ In 1883 Jean Alfred Fournier, a French virologist and dermatologist found five men with gangrene in the

genital area with unnoticed the obvious cause. Infection of Fournier's gangrene had a characteristic, which might cause thrombosis of the subcutaneous vessels resulting in skin necrosis in the vicinity.²

In the National Database Investigate, The Epidemiology of Fournier's gangrene showed the mortality rate of Fournier's gangrene cases reached 20-40% with an incidence rate of 88%. The highest incidence of Fournier's gangrene in the southern United States reached 1.9 cases per 100.000 men. With the death rate reaching 6.2% while the lowest in the west and western half of the United States was 1.3 cases per 100.000 men.³

In the last few years, the cases of Fournier's gangrene had tended to increase due to the underlying disorder of Fournier's gangrene such as diabetes mellitus, immunosuppression, chronic liver, and kidney disease. The highest underlying disorder which according to a study by Li YD (2014) identified 41 of 51 patients diagnosed with Fournier's gangrene was caused by diabetes mellitus. Infection is most cases of Fournier's gangrene was a synergistic combination between aerobic and anaerobic bacteria.⁴⁻⁵

From the above explanation, the most predisposing factor was diabetes mellitus. Based on the World Health Organization (WHO) data in 2012, 3.7 million people were diagnosed with diabetes mellitus. Indonesia is in the 4th position of most countries experiencing diabetes mellitus. Riau is in the 4th position of 33 provinces in Indonesia which were diagnosed and experienced symptoms of diabetes mellitus in 2013.⁶⁻⁸

OBJECTIVE

This study was conducted to evaluate the characteristics and management of Fournier's Gangrene.

MATERIAL & METHODS

We reviewed medical records of Fournier's gangrene patient including age, etiology, invasion of bacteria, underlying disorders, clinical symptom, radiology and laboratory findings, management, and complication in Arifin Achmad Regional General Hospital, Pekanbaru, Riau Province, Indonesia in January 2012–December 2017. Statistical analysis of univariate was used. Approval of the study was obtained from the Ethical Review Board for Medicine and Health Research, Medical Faculty, University of Riau.

RESULTS

There were 19 Fournier's gangrene patients in the study.

Table 1 showed the highest number of patients was in 56-65 year old age group in 8 (42.1%) patients. The most etiology was the urogenital origin in 15 (78.9%) patients with the biggest cause in urogenital area was scrotal abscess in 8 (42.1%) patients. The most predisposing factor was old age in 10 (52.6%) and the most clinical symptom was puss on the scrotum in 10 (52.6%) patients.

Table 2 showed the most bacterial invasion in Fournier's gangrene patients was *Acinetobacter baumannii* 5 (26.3%) patients.

Table 3 showed the most radiology and laboratory investigations performed in Fournier's gangrene patients was puss for bacterial culture in 14 (73.7%) patients.

Table 1. Distribution of Fournier's gangrene patients by characteristic

No.	Characteristics	Frequency (n)	Percentage (%)
1	Age (year)		
	a. 26-35	1	5.3
	b. 36-45	6	31.6
	c. 46-55	4	21.1
	d. 56-65	8	42.1
	Total	19	100
2	Etiology		
	a. Urogenital	15	78.9
	b. Anorectal	4	21.1
	c. Dermatology	0	0
	Total	19	100
3	Urogenital		
	a. History of scrotal abscess	8	42.1
	b. Ulcer on the penis	1	5.3
	c. BAK does not come out	1	5.3
	d. Structure urethra	1	5.3
	e. Scrotal hernia	1	5.3
	f. Obstruction OUE	1	5.3
	g. Scrotum ulcers	1	5.3
3	Underlying disorder		
	a. Old Age	10	52.6
	b. Diabetes Mellitus	7	36.8
	c. Hypertension	3	15.8
	d. Renal Insufficiency	2	10.5
	e. Liver Insufficiency	2	10.5
	f. Hypoalbumin	2	10.5
	g. Anemia	2	10.5
	h. Chronic Kidney Failure	2	10.5
	i. Post Hemorrhagic Stroke	1	5.3
	j. Ca Recti	1	5.3
	k. BPH surgery	1	5.3
	l. Bladder stones	1	5.3
	m. Hyponatremia	1	5.3
	n. Hydronephrosis	1	5.3
	o. Urethra Stone	1	5.3
	p. Smoke	1	5.3
4	Clinical symptoms		
	a. Puss on the scrotal	10	52.6
	b. Scrotum pain	8	42.1
	c. Swelling of the penis	5	26.3
	d. Pineapple on the penis	4	21.1
	e. Swelling on the scrotum	4	21.1
	f. Pain in the penis	2	10.5
	g. Wet wounds	2	10.5
	h. Hyperemic post debridement	1	5.3
	i. The perianal defects of the scrotum	1	5.3
	j. Hyperemic scrotum	1	5.3

Table 2. Frequency distribution of Fournier's gangrene patients based on bacterial invasion.

Bacteria	Frequency (N)	Percentage (%)
<i>Acinetobacter baumannii</i>	5	26.3
<i>Escherchia coli</i>	4	21.1
<i>Klebsiella pneumoniae</i>	3	15.8
<i>Pseudomonas Auriginosa</i>	2	10.5
<i>Staphylococcus aureus</i>	2	10.5
<i>Morganella morganii</i>	2	10.5
<i>Pseudomonas putida</i>	1	5.3

Table 3. Frequency distribution of Fournier's gangrene patients based on examination of radiology and laboratory investigations.

Parameter	Frequency (N)	Percentage (%)
Puss for bacterial cultures	14	73.7
Blood cultures	9	47.4
Blood chemistry analysis	9	47.4
Kidney function	7	36.8
Abdominal and pelvis ultrasounds	4	21.1
Blood gas analysis	2	10.5
Histopathology	1	5.3

Table 4. Frequency distribution of Fournier's gangrene patients based on management.

Managements	Frequency (n)	Percentage (%)
Initial and preoperative Management	19	100
Postoperative management	16	84.2
Reconstructive surgery	11	57.9
Wound care	6	31.6

Table 5. Frequency distribution of Fournier's gangrene patients based on complications.

Parameter	Frequency (n)	Percentage (%)
Died	2	10.5
Acute complication (sepsis)	5	26.3
Chronic complication	0	0

Table 4 showed the frequent management of Fournier's gangrene patients were initial and preoperative management in 19 (100%) patients.

Table 5 showed the most frequent complications of Fournier's gangrene patients were acute complications (sepsis) in 5 (26.3%) patients.

DISCUSSION

This study result showed the highest number of patients were 56-65 year old age group in 8 (42.1%) patients, and the lowest one was 26-35 year old age group 1 (5.3%) patients. This result was similar to a study by Sorensen's (2009) found Fournier's gangrene patients in 50-79 years old age group in 379 (23.1%) of 1641 Fournier's gangrene patients.³ Age may affect the status of immunity. Natural killer cells (NK cells) in the human body can be affected by age. The increasing age of NK cell production also increases but its toxicity capacity decreases, causing decreased cytotoxicity response to antigens in infectious agents.⁹ This study result showed that urogenital was the most etiology in 13 (68.4%) patients. This was similar to a study by Ochoa (2010) showed in 33 Fournier's gangrene patients there were 12 (63.1%) patient with the etiology was urogenital origin.¹⁰

The most common urogenital area was the scrotum abscess in 5 (26.3%) patients. This was because the scrotal abscess was not managed properly so that the spread might reach necrosis in scrotal skin.¹¹

This study result showed the underlying disorder was old age in 10 (52,6%) patients, diabetes mellitus in 7 (36.8%) patients followed by post hemorrhagic stroke, rectal cancer, BPH surgery, bladder surgery, hyponatremia, hydronephrosis, urethral stone, and smoking in 1 (5.3%) respectively. A study by Yan-Dong Li (2014) found different results in which 41 of 51 Fournier's gangrene patients had diabetes mellitus as the most predisposing factor.⁵ Similarly, a study conducted by Sorensen (2009) 37% of patients with the most predisposing factors was diabetes mellitus.³ This was because old age was rarely categorized as an underlying disorder, although elderly patients significantly affected the prognosis.¹² Patients diagnosed with Fournier's gangrene generally had more than one underlying disorder. Patients with old age might have diabetes mellitus and hypertension. Therefore, old age is rarely included in the underlying disorder of Fournier's gangrene.

Age and diabetes mellitus are interrelated. This is caused by the aging process associated with the occurrence of diabetes mellitus. The cause of diabetes mellitus in old age is impaired glucose tolerance and insulin resistance. Impaired glucose tolerance is thought to be due to decreased insulin secretion by pancreatic beta cells. Insulin resistance itself in old age can be influenced by several factors, first, changes in body composition (muscles that previously 19% to 12%. Fat previously 14% to 30%) so the decrease in fat percentage then decreased also insulin receptors. Second is the lack of physical activity resulting in a decrease in the number of receptors binding to insulin so that the translocation rate of Glucose transporters-4 (GLUT-4) also decreases. Both of these cause the decrease in speed as well as the amount of glucose uptake. Third, changes in dietary patterns in old age due to reduced teeth increase the percentage of carbohydrate foods. Fourth is the neurohormonal changes, particularly insulin like-growth factor-1 (IGF-1) and dehydroepiandrosterone (DHEAS) plasma. Both of these hormones will decrease in old age. Serum IGF-1 decreases 50% in old age to decrease glucose uptake due to decreased insulin receptor sensitivity. DHEAS is associated with increased body fat and decreased physical activity.¹³

Diabetes mellitus can also affect the immune system. Hyperglycemia in the bloodstream damages the walls of blood vessels, especially capillaries.¹⁴ If the blood vessels are damaged, the oxygen flow will be inhibited so that wound healing is difficult.¹⁵

This study results showed that pus in the scrotum was the most symptom in 10 (52.6%) patients followed by scrotal pain in 8 (42.1%) patients. The fewest were hyperemic post debridement, scrotal perianal defect, scrotal hyperemic, ulcer in testis, skin loss in scrotum, and scrotum crepitation in 1 (5.3%) patients respectively. Slightly different from a study by Ashrafuzzaman (2017) showed 100% of Fournier's gangrene patients experienced pain as the most common clinical symptom.¹⁶ This was due to patients were delayed coming to the hospital. Generally, the patient complains of old pain and pus appears in the genital area and then come to the hospital. Pus formation was due to adequate virulence of bacteria so that neutrophils might phagocyte the bacteria and monocytes would turn into macrophages. Together with neutrophils, macrophages would phagocyte bacteria. Once the infection resolved, neutrophils along with the bacteria would die. The dead

neutrophil along with the bacteria might form pus.¹⁵

The results of research found *Acinetobacter baumannii* was the most bacterial invasion in 5 (26.3%) patients while the least one was *Pseudomonas putida* in 1 (5.3%) patients. Of a total 19 patients, 13 patients carried out pus culture and 6 patients did not carried out pus culture. Slightly different from a study by Orhan (2017) showed 17 patients carried out pus cultures in which 10 (58.8%) of Fournier's gangrene patient had *Escherichia coli* strain and followed by *Acinetobacter* in 11.8% patients.¹⁷ Similarly, a study by Ochoa (2010) found in 33 Fournier's gangrene patients found all positive *Escherichia coli*.¹⁸ A study by Benjellon (2013) found 85.6% of Fournier's gangrene patients had *Escherichia coli* as the most common bacterial invasion.¹⁹

The patients who did not carry out pus cultures might be caused by several reasons, such as there was no pus found in the affected area due to the patient came with the situation in which debridement had been done elsewhere. In addition, patients who come with sepsis and various systemic diseases accompanying ultimately die causing pus culture to know the invading bacteria was not done. Patients were unavailable for culture to know which invading bacteria resulted in unknown bacteria invaded the patients. Blood cultures might be performed to determine and levels of septicemia.² Fournier's gangrene patients who had sepsis in our hospital did not have blood cultures. This might be caused by some patients have cultured and other patients come with sepsis and conditions and eventually die so there was no examination of the blood culture.

Fournier's gangrene is an infection of polymicrobial, although aerobic and anaerobic bacteria are responsible, but anaerobes are less common. One individual can be found polymicrobial, in other words, it can be found more than one microbe in both aerobic and anaerobic bacteria. Both might work synergistically for the disease might quickly spread. For example, aerobes lead to platelet aggregation and complement system. While anaerobes can produce heparinase. The work of both might lead to an extremely unexpected intravascular clotting activity occurring in the blood vessels on the skin surface of the gangrene.¹¹

The underlying cause of the different research results was *Acinetobacter* as the cause of the most common nosocomial infections. These bacteria might easily live and multiply because these bacteria were also resistant to many drugs (multi-resistant

MDR). However, these bacteria rarely resulted in infection in patients with good immunity.²⁰ According to the WHO in high-income countries, the incidence of nosocomial infections was 7.6%, whereas countries with middle and lower income are 15.1%.¹⁴

The study result of this research showed that the frequent radiology and laboratory examinations in 14 (73.7%) patients, while the least was blood gas analysis examinations in 2 (1.3%) patients and histopathology examination in 1 (5.3%) patients. This study result suited a study by Orhan (2017) showed 17 (58.6%) patients of 29 Fournier's gangrene patients which perform pus culture as the most examination modalities of investigation.¹⁷

Fournier's gangrene is closely related to the polymicrobial invasion. How to know which microbes invade and can be used as a reference for the next treatment, it is necessary to do the culture. Tub culture is the easiest culture to do considering the lack of invasive action performed and easy to do in patients so that pus culture becomes the most frequent radiology and laboratory examinations.

The blood gas analysis and histopathology examinations were not directly useful in patients with Fournier's gangrene disease without systemic disease. Patients underwent blood gas analysis had accompanying systemic diseases such as chronic renal failure. Histopathology can be performed if there is suspicion of malignancy.

This study result showed the most common management were initial and preoperative management in 19 (100%) patients and postoperative management in 16 (84.2%) patients. The least management was wound care in 6 (31.6%) patients. This result suited to a study by Anil Kumar (2016) showed 30 patients performed initial and preoperative management.²¹

Management performed in one patient varied. Patients receiving initial and preoperative management might be debridement, antibiotic therapy prior to pus culture, improvement of hemodynamic conditions if sepsis and anemia were present. There were 6 Fournier's gangrene patients who underwent the procedure until it was complete. The suspected length of hospitalization due to the length of completion of treatment makes the patient decided not to continue treatment at the hospital.

An antibiotic therapy prior to culture and debridement can be done immediately to stop the spread of the rapidly expanding necrotic tissue. 24 hours is a golden period for debridement. If less than

24 hours of patient mortality is performed as much as 36% whereas if more than 24 hours of mortality increased to 70%.²²

The study results showed the most complications were acute complications, namely sepsis in 5 (26.3%) Patients. A study by Efem (1994) showed of all 20 Fournier's gangrene patients, 8 (40%) had sepsis.²³ Generally, the patients came late. Patients came already with sepsis.

Fournier's gangrene is associated with both gram-negative and gram-positive polymicrobial. In this study, *Acinetobacter baumannii* with *Escherichia coli* were the most common pathogen. *Escherichia coli* is a gram-negative bacteria. Gram-negative bacteria can produce endotoxins produced from bacterial walls. This endotoxin may activate the macrophages and complement system so that it releases proinflammatory cytokines. Proinflammatory cytokines can affect endothelial damage, microvascular dysfunction, tissue oxygenation disorders, and organ trauma.^{2,24} This is what causes sepsis to fall into septic shock.

CONCLUSION

The study result showed that Fournier's gangrene cases occurred mostly in 56-65 year old age group in 8 (42.1%) patients and the most frequent etiology was the urogenital source in 15 (78.9%) patients. Most invasion bacteria were *Acinetobacter baumannii* in 5 (26.3%) patients and the most underlying disorder was elderly age in 10 (52.6%) patients. The most frequent symptom was puss in the scrotum in 10 (52.6%) patients and the most laboratory examination was bacterial cultures of the pus in 14 (73.7%) patients. The most frequent treatment for Fournier's gangrene was initial and preoperative management in 19 (100%) patients and the complication of Fournier's gangrene was acute complication (sepsis) in 5 (26.3%) patients.

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