

Reconstruction of Soft Tissue Defects in Fournier's Gangrene

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Conflict of interest: Nil

Abstract:**Aim:** The aim of this study is to investigate the reconstruction of soft tissue defects in Fournier's gangrene at a tertiary care centre.**Materials and Methods:** The type of this study is a prospective study which was held in Patna Medical College and Hospital in Patna, Bihar, India. 58 number of individuals affected with Fournier's gangrene at a tertiary care center who underwent an initial removal of the dead skin surface for the purpose of reconstruction were selected for this study. Detailed information on the patient's sex, age, infectious site, depth of the wound and the type of reconstruction were noted. Also, a distinct examination of the function of testes was performed at 6 months with regards to the morphology and the number of sperms.**Results:** Totally 58 patients affected with Fournier's gangrene were included in this study. Among the total patients, 2 were female and the remaining 56 were males. The average age of the individuals in this study was 37 years. The predominant coexisting health condition among the patients was found to be DM in about 36 patients (62%). The wound healing was recovered by secondary intension in about 16 patients. Additionally, 14 patients have undergone scrotal advancement flap, 22 patients had undergone split thickness skin grafting (STSG) of exterior infection and hence the total rate of complication in this study was found to be 19%.**Conclusion:** A complete removal of the dead skin surface and initial repair of wounds are significant in the diagnosis of Fournier's gangrene. Different types of reconstruction choices are accessible in order to assist the flap besides the grafting of skin. An important note is that all these processes aim to preserve the function of the testes for a longer period of time.**Keywords:** Fournier's gangrene, genital organs, genital inflammation, reconstruction, skin flap.

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Introduction

Fournier's gangrene (FG) is an occasional yet deadly, life-threatening disease that requires immediate medical diagnosis in order to save the life of the affected individuals [1]. FG is a flesh-eating disease that mainly targets the soft tissues of the genital organs including the perineum and can even penetrate and damage the abdominal wall [2]. This infection can be categorized as a type of necrosis that causes cell death and can spread throughout the body rapidly [3]. People with unmanageable diabetes are more prone to the disease. The major symptoms of the disease include genital inflammation and perineal region, which is often accompanied by a severe pain, change of skin color from blue grey to black when the cells are dead completely, odor in the affected skin surface and discomfort [4,5]. The exact cause of the disease is unknown but frequent abscesses in perianal and around perirectal regions, crevices in the anus and injury may worsen the disease [6, 7]. Men are more predominant to Fournier's gangrene although few authors reported

the occurrence of this disease in females too [8, 9]. This infection arises due to urogenital and colorectal diseases and may get spread out throughout the body very quickly and so immediate treatment is needed to decrease the severity and mortality of the disease [10].

The medical diagnosis includes quick and appropriate treatment plans, antibiotics, reconstruction and removal of the dead skin surface [11]. The main aim of this study is to investigate the reconstruction of soft tissue defects in Fournier's gangrene at a tertiary care centre.

Materials and Methods**Study design:** The type of this study is a prospective study which was held in Patna Medical College and Hospital, Patna, Bihar, India.**Study size:** 58 number of individuals affected with Fournier's gangrene at a tertiary care center who underwent an initial removal of the dead skin sur-

face for the purpose of reconstruction were selected for this study.

Data collection: Detailed information of the patient's sex, age, infectious site, depth of the wound and the type of reconstruction were noted. Also, a distinct examination of the function of testes was performed at 6 months with regards to the morphology and the number of sperms. Unfortunately, 4 patients died due to septic infection and multi organ failure. The medical diagnosis for the patients were given such as initial dose of broad-spectrum antibiotics and then continued with culture specific antibiotics.

Study setting: Repeated procedures of removal of the dead skin surface were performed whenever needed. As for wounds and injuries concerned, they are treated with cotton dressing soaked in betadine solution. The dressing was changed two times per day until the wounds were healed. The treatment for healing were taken in steps of secondary intention, skin graft, scrotal advancement flaps and positioning the male testes in medial subcutaneous thigh pockets region. The patient's sex, age, coexisting health condition, infectious site, depth of the wound and the type of reconstruction were all examined. Most importantly, a complete assessment on the testes function of all the male patients included in this study was done after six months of post healing by analyzing the number of motile sperm and its morphology.

Bias: The study is a prospective design introduces potential recall and documentation biases while the exclusion criteria and the reliance on a single tertiary centre may lead to selection and institutional biases, impacting the generalizability of the findings. Awareness of these potential biases is essential for interpreting and applying the study's results accurately.

Ethical considerations: The study was approved by the Institutional Ethics Committee.

Results

Participants: Totally 58 patients affected with the infection were included in this study. Among the total patients, 2 were female and the remaining 56 were males. The age of the patients was between 23 to 66 years of age and hence the average age of the individuals in this study was 37 years. The predominant coexisting health condition among the patients was found to be DM in about 36 patients in about 62% of the selected patients.

The major associated symptoms were found to be fever in about 52 patients which is 89.6% of the selected population, secondly changes in skin texture was found in about 42 patients which is 72.5% of the selected population and thirdly discharge of pus was found in 38 patients which is 65% of the selected population.

Removal of the dead skin surface was performed in all the patients and repeated procedures of removal of the dead skin surface were performed in 32 patients (27%) whenever needed. 4 patients died due to septic infection and multi organ failure; they were known to have unmanageable diabetes and are old aged. 36 patients were affected with multi-microbial infection which is about 62% of the selected population and 22 patients were affected with single microbial infection which is about 37% of the selected population.

As for the examination of the defects it was majorly observed in scrotum region in about 50 patients, 2 patients were found to have the defect in penile shaft part, 4 patients were found to have the defect in groin and scrotum region and 2 patients were found to have the defect in abdominal wall and labia. The measurement of the defect in the selected patients was between 4x3 cm to 21 x 16 cm and so the average measure was found to be 7x6 cm (Table 1).

Table 1: Distribution of patients according to the wound size

Size of wound	Number of patients
Small wounds (<25% of scrotal involved)	14
Medium sized wounds (<50% of scrotum involved)	18
Large wounds (>50% of scrotum involved)	20
Very large wounds (involving perineum, abdomen and groin)	6

As for wounds and injuries concerned, they are treated with cotton dressing soaked in betadine solution. The dressing was changed two times per day until the wounds were healed. The treatment for healing was taken in steps of secondary intention in about 16 patients, scrotal advancement flaps was performed in 14 patients and positioning the male testes in medial subcutaneous thigh pockets region was performed in 2 patients (Table 2).

Table 2: Reconstruction options employed

Procedure	Number of patients
Healing by secondary intention	16
Split thickness skin grafting	22
Scrotal advancement flap	14
Medial thigh pocket	2

Complications were observed in 10 patients which is about 17.2% of the selected population. Secondary wound coverage was needed in 6 patients. A complete assessment on the testes function of the male patients involved in this study was done after six months of post healing by analyzing the number of motile sperm and its morphology and the result was normal in about 44 patients which is 75% of the selected population (Table 3).

Table 3: Complications encounters

Complication	Number of patients
Partial graft loss	4
Total graft loss	2
Partial flap necrosis	2
Wound dehiscence	2

Discussion

Fournier's gangrene is a life threatening multi organism infection that requires immediate medical attention. It mainly targets the soft tissues of genital organs including the perineum, scrotum and can even penetrate and damage the abdominal wall. The death rates due to this infection can be minimized by early detection and accurate treatment plans. The infection is known to majorly affect the elderly people with unmanageable diabetes especially above 60 years of age [12].

Reconstruction option for the defects in scrotum and perineal region in Fournier's gangrene is a difficult choice because of its resulting color, texture and contour of the surface as they can't be easily recreated but various types of reconstruction choices are accessible in order to assist the flap besides the grafting of skin [13].

Among the different reconstruction options, STSG stands as a simple and feasible procedure, and it is also considered to be safe for any measurements of the wound. The main advantage of STSG is that it protects the normal function of the testes, and the thin skin looks similar to the skin of the scrotum [14].

The scrotal advancement flap is dependent on the natural characteristics of scrotal skin which is stretchable and allows extensive scrotal wounds for reconstruction. The advancement of this particular flap is that the donor site removal is only minimum [15].

Predominantly, most of the male individuals involved in the study were found to have normal function of the testes at six months of post healing and their sperm motility and morphology was also good.

Conclusion

Fournier's gangrene (FG) is a flesh-eating infection that mainly targets the soft tissues of the genital organs including the perineum. The exact cause of the disease is unknown but frequent abscesses in perianal and around perirectal regions, crevices in the anus and injury may worsen the disease. FG spreads out throughout the body very quickly and

so immediate treatment is needed to decrease the severity and mortality of the disease.

A complete removal of the dead skin surface and initial repair of wounds are significant in the diagnosis of Fournier's gangrene. Different types of reconstruction choices are accessible in order to assist the flap besides the grafting of skin. An important note is that all these processes aim to preserve the function of the testes naturally.

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List of abbreviations

STSG - Split thickness skin graft

FG - Fournier's gangrene

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