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EVALUATION OF SCROTAL RECONSTRUCTION WITH THIGH FLAP IN CASE OF MAJOR SCROTAL SKIN LOSS

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ABSTRACT

Background: Avulsion of the skin of the scrotum and penis is an uncommon injury, which in addition to obvious physical deformity can lead to significant psychological and emotional distress. Scrotal skin loss may occur due to external trauma, burns, infections, self-mutilation, constrictive devices, and lymphedema. **Objective:** The study is aimed to describe the outcome of thigh flap for reconstruction of major scrotal skin loss patient admitted in a tertiary care hospital. **Methods:** This was Prospective observational study. This study was carried out Department of Burn and Plastic Surgery in Khulna Medical College & Hospital six months period after approval of protocol. Patient who were admitted in KMCH with major scrotal skin loss. Due to shortage of time and resource constraints, total 20 study population were included for the study. **Result:** A total of twenty cases of major scrotal skin loss were studied during last six-month duration of the study. The most common organism isolated was Bacteroides found in 7 patients (41.2%). This was followed by streptococci (29.4%), Prevotella (29.4%), Staphylococci (23.5%) and E. coli (23.5%). See table 2 for more details. All the flaps survived completely except flap tip necrosis occurred in two case (8.33%) and minor wound infection occurred in three case (12.50%) both of which were improved with conservative treatment. **Conclusion**: Several techniques were practiced for scrotal reconstruction including thigh flap in case of major scrotal skin loss. In this study, fournier's gangrene was the most common of cause of major scrotal skin loss.

KEYWORDS: Scrotal skin, Traumatic Avulsions, Skin Graft.

INTRODUCTION

The scrotum is an anatomical male reproductive structure that consists of a suspended dual-chambered sack of skin and smooth muscle.[1,2] Traumatic avulsions of the scrotal skin are commonly caused by revolving machinery, automobile versus pedestrian accidents and falls.[3] Major or extensive skin loss(more than 60%) poses a considerable challenge for the surgeon.[4] Scrotal surgery encompasses a wide-variety of surgical techniques for an even wider variety of indications.[5] If only a partial loss of skin occurs, primary closure may be possible. Where skin loss is complete it has been the practice to bury the testes under normal skin at the edge of the wound either at the superficial inguinal ring and later date the scrotum is reconstructed in a single or multiple staged procedure with local flaps.[6] There are several factors that determine choice of reconstruction techniques include the size of defect, surgeon's preference and patient's choice. The multiplicity of techniques demonstrates that there is potentially no single favored reconstructive technique.[7] There are several established reconstructive surgery, all of which share the goal of protecting the denuded testis, maintains thermoregulation to allow spermatogenesis, and cosmesis while at the same time minimizing morbidity.[8,9] A spectrum of surgical options have been used for closure of major scrotal wounds are skin grafting, burying them underneath the medial thigh skin, tissue expansion of adjacent tissues[10,11] and use of various types of flaps like deep inferior epigastric, omental pedicle flap, rectus abdominis muscle flap and thighs flap.[12,13] Reconstruction of the scrotum is important for functional, cosmetic, and psychological reasons. Although the vast majority or reconstructive options in the world include the use of flaps, either fascio-cutaneous or musculo-cutaneous but in our country common procedure performed for testicular coverage is burying the testis in the thigh that causes

repeated trauma to testes, testicular atropy, unpleasant aesthetic appearance and psychological effect on the patient of absence of scrotum. Recently some regions of Bangladesh are being performed reconstruction of scrotum with thigh flaps but there are few documented study evaluating their outcome but it is a good choice for scrotal reconstruction because of avoiding skin graft problems, preserving adequate sensation, and covering a large defect.[13]

OBJECTIVE

General Objectives

To describe the outcome of thigh flap for reconstruction of major scrotal skin loss patient admitted in a tertiary care hospital.

Specific Objectives

- To assess the clinical presentation of the major scrotal skin loss patients
- To assess the etiologies of major scrotal skin loss
- To assess the early outcome of the study participants following thigh flap
- To assess the demographic characteristic of the respondent.

MATERIAL AND METHODS

Study Design: Prospective observational study
Place of Study: Department of Burn and Plastic Surgery in Khulna Medical College & Hospital
Study Period: Six months period after approval of protocol
Study population: Patient who were admitted in KMCH with major scrotal skin loss
Sampling Method: Purposive convenient sampling
Sample size: Due to shortage of time and resource constraints, total 20 study population were included for the study.

Selection criteria

Inclusion criteria

- Patient with major scrotal skin loss
- Willing to participate

Exclusion criteria

- Patients with history of any disease that may hamper wound healing .
- Not willing to participate
- Crushing injury of the groin and/ or medial thigh, fournier's gangrene with synergistic gangrene of the groin and/or medial thigh causing loss of flap area are excluded.

Study procedure

Data were collected by following procedure. Following admission, all patients were assessed and managed properly. After initial resuscitation, all of them were prepared for operative procedure. Following these, study population were selected in according to inclusion and exclusion criteria and were approached for participation of the study. Face to face interview was conducted by using a semi-structured questionnaire containing socio-demographic parameters, relevant information about their clinical features, disease duration and aetiology.

Data collection sheet was formed focusing to find out socio-demographic characteristics, clinical features, examination findings, aetiology of the major scrotal skin loss and follow up findings. All of the procedure were done in single surgeon to avoid skill bias. Finally analysis was done SPSS 20.

Data Processing and Analysis

After collection of all the required data, these were checked, verified for consistency and tabulated using the statistical software. All statistical analyses were performed using the SPSS 20.0. Statistical significance is set as 95% confidence level at 5% acceptable error level. Data were presented as the proportion of valid cases for discrete variables and as means ± standard deviations and/or medians for continuous variables. Differences in baseline characteristics were compared using either the unpaired t-test or the chi square test. A p value of <0.05 was considered significant.

RESULTS

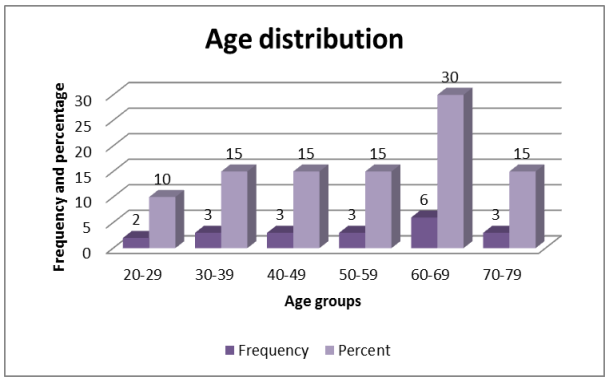

Figure 1: Age distribution of patients (n=20).

A total of twenty cases of major scrotal skin loss were studied during last six-month duration of the study. In this study, youngest patient was 25 years old and oldest patient was 74 years old with mean age of presentation of 53.50 years (±15.26) and median age of 57.50 years. Maximum incidence of major scrotal skin loss was found in 7th decade (30%). (Figure 1)

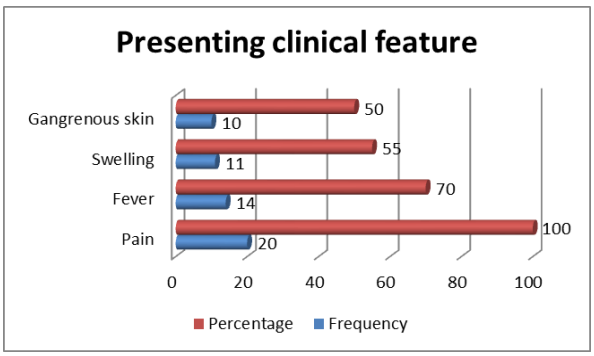

Figure 2: Presenting clinical features of patients (n=20).

All twenty patients presented with pain (100%), 14 of them had fever (70%), 11 of them had scrotal swelling (55%) and 10 of them had gangrenous skin (50%). (Figure 2).

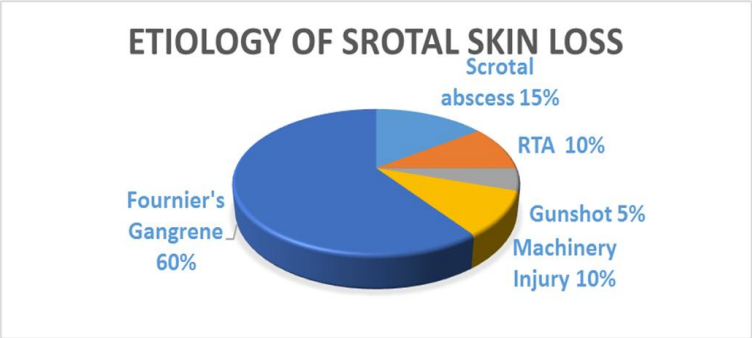

Figure 3: Etiological distribution of patients (n=20).

A pie chart in figure 3 shows that, out of twenty patients, fourteen had Fournier's gangrene (60%) and three had scrotal abscess (15%), two had experienced road traffic accident (10%), two had machinery injury(10%) and remaining one had gunshot injury (5%).

Table 1: Predisposing factors.

Co-morbidities	Frequency	Percentage
Hypertension	9	45
DM	12	60
Hypothyroidism	4	20
Hypercholesterolemia	11	55
Hypertriglyceridemia	13	65
Smoker	11	55
Cardiac disease	5	25
None	4	20

A number of predisposing factors or comorbidities were examined including diabetes mellitus (60%), HTN (45%), Dyslipidemia (65%), Smoking (55%) and 20% patients had no comorbidities. Table 1 shows more details.

Table 2: Most common organism in infective cases (n=17).

Organisms	Frequency	Percentage
Bacteroides	7	41.2
Streptococci	5	29.4
Staphylococci	4	23.5
Prevotella	5	29.4
E. coli	4	23.5
Corynebacterium	3	17.6
Enterococci	2	11.8
Proteus	2	11.8
Clostridium perfringens	1	5.9

Fourteen patients had poly microbial infections whereas three patients had no growth in their microbial cultures. The most common organism isolated was Bacteroides found in 7 patients (41.2%). This was followed by streptococci (29.4%), Prevotella (29.4%), Staphylococci (23.5%) and E. coli (23.5%). See table 2 for more details.

Table 3: Distribution of procedures performed for scrotal reconstruction (n=20).

	Flap used in Unilateral Skin Loss	Flap used in Bilateral Skin Loss	Number of cases	Percentages of flap
Anteromedial	14	6	17	83.33%
Pudendal	2	2	3	16.66%
Total	16	8	20	100

Table 3 shows that twenty four thigh fascio- cutaneous flaps were elevated for coverage of large scrotal defects in twenty patients. Single flap for unilateral defect and double flaps for bilateral defects were elevated and inset (Figure 1b, 1c & 2b). The mean patient age was 53.50years (range 20yrs to 79yrs).The mean time between the last debridement performed and the reconstructive procedure was 15.9± 3 days. The flaps used in my study were anteromedial thigh flap (83.33%) and pudendal thigh (16.66%), shown in table 3.

Table 4: Complication of procedure performed.

Name of complications	Flap	Number of flaps(n=24)	Percentages of flaps(n=24)
Wound infection	Pudendal	2	8.33%
	Anteromedial	1	4.16%
Flap tip necrosis	Pudendal	1	4.16%
	Anteromedial	1	4.16%

Comparing complication of procedures performed in this study shows that wound infection was occurred in two (8.33%) in pudendal flap and one in case of anteromedial thigh flap. Flap tip necrosis occurred in one case (4.16%) in anteromedial thigh flap and one case (4.16%) in pudendal flap, shown table 4.

All the flaps survived completely except flap tip necrosis occurred in two case (8.33%) and minor wound infection occurred in three case (12.50%) both of which were improved with conservative treatment.

DISCUSSION

The "replace like with like" principle is important for tissue functionality as well as aesthetic purposes. In Fournier gangrene, reconstruction of scrotal, penile, and perineal defects after surgical debridement is a challenge. These organs have unique texture, color, and contour that are difficult to recreate. The best cosmetic and functional results are achieved by primary closure without tension, which is only possible for very small defects of the scrotum. Any tension on the closure is an indication for reconstruction.[14]

Mean age of our patients was 53.5±15.26 years. The youngest and oldest patients were 25 and 74 years old respectively. After extensive debridement, all patients presented soft-tissue defects of scrotal and perineal areas. Maximum incidence of major with scrotal skin loss occurred after 50 years of age. Similar studies done by El Saady et al.[15] "Different modalities of reconstruction in fournier gangrene" in 2013 conducted in General Surgery department, Zagazig University, by Iwuagwu, Mopuri and Fitzgerald[16] "Scrotal reconstruction with modified pudendal thigh flaps" in 2015 also found similar age distribution of their patients which is further supported by Norton et al.[17] but in contrast with Ahmed and Mbibu.[18]

Most of the patients in the present study had specific aetiology with defined predissposing factors. Urethral stricture and periurethral abscess were the main aetiological factors responsible for infected cases of scrotal skin loss noted in our study. Diabetes and dyslipidemia were the most common co-morbid conditions in our study, with more than 60% patients being affected. This association of diabetes with Fournier's gangrene is due to defective phagocytosis, microangiopathy and increase incidence of genitourinary and perianal infections. Predisposing factors like HTN, chronic smoking, extremes of age were also evident. Chronic liver disease, HIV infection and other conditions causing immune compromise leading to fulminant infection have also been associated with Fournier's gangrene but were not seen in our study group.[19]

Infection extends rapidly along Colles' and Dartos fascia and via Scarpa's fascia may involve the abdominal wall.[20,21,22] It has been noted that in Fournier's gangrene, the resultant microvascular thrombosis with subsequent dermal necrosis is due to anaerobes which release enzymes such as collagenase, heparinase along with platelet aggregation and complement fixation induced by aerobes.

In Fournier's gangrene, commonly Enterobacteria, particularly Escherichia coli, streptococcal and staphylococcal species and Clostridia, are encountered frequently in combination.[23] In the present study, in infective cases, it was seen that Bacteroides, Streptococcus, Staphylococcus, Prevotella and E. coli were the predominant isolates in culture. Fourteen patients had polymicrobial infections whereas three patients had no growth in their microbial cultures, which is an echo of previous series. Studies have shown that staphylococcus and streptococcus produce enzymes such as streptokinase, streptodornase, hyaluronidase, which cause tissue damage.[24]

Fever, pain, swelling, erythema and tenderness of the genitalia and perineum and gangrene are the most common clinical presenting features.[25] Patients may also present in shock or altered mental status due to systemic symptoms of sepsis.

Complete removal of all necrotic tissue including skin, subcutaneous tissue and fascia, until well-vascularised tissue remains should be the aim of wide surgical debridement and this may require multiple sittings to achieve. Since testis has independent blood supply directly from the abdominal aorta via testicular artery, it remains unharmed and orchidectomy is not necessary.[20,22] Treatment with hyperbaric oxygen for Fournier's is debatable, as its use in any other wound management and may support surgical debridement but not second it. As proven in many studies, early surgical debridement and antibiotic use with hyperbaric oxygen has significant survival advantage. Use of negative pressure wound therapy (NPWT) has also been advocated by many researchers such as Morykwas and others reporting enhanced bacterial clearance. However the greatest difficulty is in application of NPWT owing to anatomy of the region. But if applied will aid in treatment of large perineal wounds by reducing infection, speeding granulation and promoting wound contraction.

After stabilizing the patient, removal of the necrotic tissue and controlling the infective process, the resultant soft tissue defect has to be addressed with appropriate reconstructive procedure. Reconstruction of scrotum is a major challenge because of functional, psychological, and cosmetic reasons.[26] Several procedures have been described for the reconstruction of scrotal defect. The appropriate method of reconstruction is decided after taking into account patient's general condition, the extent of soft tissue defect, and viability of surrounding skin.[27] All of the 20 patients in our study underwent reconstructive procedures by various types of thigh flaps. The aim of the selected procedure is to cover the defect

as aesthetically as possible and also to retain the functionality of urogenital and anorectal region.

Mean time required for hospitalization in our study was very similar to a recent work in Turkey[28] but lengthier than another very recent study in Adichuchanagiri Institute of Medical Sciences, Karnataka, India. Shorter hospital days were also required in other studies also. Difficulty in infection control, uncontrolled diabetes, partial wound dehiscence, suture line necrosis were the reasons behind this. Multi-drug resistant organisms in some of our cases made it difficult for us, hence took longer hospital stay of the patients.

Described reconstructive options in medical literature are many and include primary or secondary suturing, split thickness skin grafting, advancement flaps, fascio-cutaneous, myo-cutaneous or muscle only flaps or perforator flaps. Though as prescribed in literature, procedures are to be followed according to reconstructive ladder with lower rung simple procedures to be preferred over complex procedures, it may not hold good always and may require the operative surgeon to opt complex procedures to attain desired wound closure. Hence each case has to have tailor made reconstructive plan taking into account patient's general condition, defect location and severity, availability of locoregional tissue and patient's wish too.

If defect involves less than 50% of the scrotal surface area, an advancement flap gives good aesthetic result. For defects involving more than 50% of the scrotum, skin grafts or pudendal thigh flaps are wise choices. In cases of combined scrotal and perineal defects pudendal thigh flap, anterolateral thigh flap, superomedial thigh flap or gracilis muscle flaps can be used. With advancement in wound management, cases treated successfully using dermal regeneration templates have been reported.[29] The use of these synthetic dermal substitutes have been opined to reduce scarring and pliability of skin providing functional and aesthetic benefits.[30]

One of the hotly pursued factor in treatment of Fournier's gangrene is the effect of the engaged procedure on spermatogenesis. This is especially important in adult males. However, studies have shown that though there is significant decrease in spermatogenesis after neoscrotum creation in scrotal-skin-lost patients, apparently it is not severe enough to impact fertility and child bearing capability of the male patient and overall ability of the couple to achieve pregnancy remains unaltered.[30]

Balakrishnan was the first one to use a skin graft to manage scrotal defect. The presence of healthy granulation tissue and intact tunica vaginalis increase the success rate of above mentioned procedure.[31] Despite having a good cosmetic result, the problems that beset this method are contractions, less mobility, and poor protection of the underlying testicles. Wolach *et al.*[32] mobilized the testes to medial thigh subcutaneous pouches in 40% of his patients. This method has a high success rate and requires less surgical skill with lesser morbidity. However, disadvantages such as unsuitable environment for testicular function which can cause possible atrophy, feminine appearance, pain, tension, and fullness sensation again rule out this as the procedure of choice.[33]

In this study, we used antero medial (83.33% and pudendal (16.66%) thigh flap coverage in twenty patients with scrotal soft-tissue loss (Table-3). Post operative follow up was taken carefully. Initially minor complications such as flap tip necrosis was found in two cases, minor wound infection were noted in three cases third-day's follow-up (Table-6). All cases were managed conservatively. All flaps survived well at fourteen-day's follow-up. The flaps showed good sensation except for the transient loss of sensation over anterior part of thigh in one patient which he regained in the follow up period. These advantages were comparable to that reported by Ferreira *et al.*[22] in their review of the management of 43 patients with Fournier's gangrene and by Ahmad et al.[28]

CONCLUSION

Several techniques were practiced for scrotal reconstruction including thigh flap in case of major scrotal skin loss. In this study, fournier's gangrene was the most common of cause of major scrotal skin loss. It was observed that reconstruction with thigh flaps is simple, safe and single stage procedure. It provides sensate coverage; achieve reasonable aesthetic result, preserving male identity and closure of donor site. Therefore, it can be said that thigh flap is could be alternative and very reliable for coverage of major scrotal defects.

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