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Fertility profile of post Fourniers gangrene patients: Does neoscrotal environment alter fertility?

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ABSTRACT

Objective: To ascertain changes in fertility in post Fournier's gangrene patients on account of changed scrotal environment. **Methods:** Sixty post Fournier's patients were as cases and 50 non Fournier's individuals aptlyserved as controls. All subjects were followed up for 1 year. Aspects of fertility were investigated by means of a seminogram at 6 months and analysis for volume, viscosity, sperm concentration, motility and morphology according to WHO guidelines was done. Ability of the couples to conceive children in 1 year was also noted. The control group was investigated similarly and values were compared for significance. **Results:** The seminogram results were found out to be highly significant as there was marked difference in values (*chi*-square value 6.28, *P*-value< 0.012) whereas there was no significant association between attaining pregnancy at 1 year in two groups. **Conclusions:** A readily palpable difference in the seminogram values observed in Fournier's patients is the most significant finding of this study. Also highlighted was that despite such seminogram changes the overall ability of the couple to achieve pregnancy remains unaltered.

1. Introduction

Fournier's gangrene is a horrendous infection of the genitalia that causes severe pain in the genital area (in the penis and scrotum or perineum). It was first described as an idiopathic, rapidly progressive necrotizing gangrene of the male genitalia in 1883 by Jean Alfred Fournier, a French venerologist. He emphasised three characteristics: abrupt onset of scrotal pain and swelling in a healthy young man, rapid progression to gangrene, and the absence of a definitive cause[1].

Although originally described in healthy young men Fournier's gangrene is frequently seen in elderly patients as well as children and women[2].

Well known complications of Fournier's gangrene include single or multi-organ failure, as well as large scrotal, peri-anal, penile and abdominal wall skin defects. Another less investigated complications may affect the urogenital system. The sexual function may be impaired by penile deviation or penile torsion as well as loss of sensitivity to the penile skin or pain during erection (Ferreira, 2007) and infertility. There is a possible relationship between infertility/altered spermatogenesis[3] on account of the altered scrotal environment after skin grafting/flap coverage of the denuded scrotum which is invariably done. The new skin in contrast to the scrotal skin is less pliant and hence less conducive to carry out the function of temperature regulation which is imperative to normal spermatogenesis. Theoretically this change of scrotal environment has the propensity to affect spermatogenesis and in turn the fertility of a post Fournier s gangrene patient.

There is absolute paucity of literature on this intriguing topic and it has never been fully investigated. This study intends to find out the effects of Fournier's gangrene and the neo scrotal environment (post-reconstruction) on the male sexual function/spermatogenesis and the fertility patterns in couples where the male partner suffered from Fournier's gangrene within the last 1 year.

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2. Materials and methods

It was a prospective study which included cases of Fournier's gangrene admitted to our hospital from June 2005 to June 2009 and undergone some sort of surgical intervention to reconstruct the scrotal defect and later followed up on outpatient basis for a period of two years. Out of a total of 210 patients with Fournier's gangrene, 68 patients were chosen based on the following inclusion criteria.

2.1. Cases

1) Patients aged 20 or 40 years of age to nullify the confounding effect of age on sexual vitality;

2) Patients having undergone a surgical procedure (skin grafting/flap cover for coverage of scrotal defect.

3) Patients without diabetes or other venereal diseases which may independently affect the sexual function;

4) Patients with intention of having a child in the next 1 year (and without either partner having undergone an irreversible family control procedure);

5) Spouses/partners of the males free from any previous gynecological or obstetric complaints and having delivered at least one child without any complications;

6) Patients with no obvious mechanical deformity secondary to Fourniers gangrene (penile deviation or penile torsion as well as loss of sensitivity to the penile skin);

7) Patients with no history of pharmacological therapies interfering with sexual function or previous genito urinary surgery.

All 68 patients were further investigated and followed up on OPD and the following factors were assessed:

1) History regarding level/quality of sexual desire, unprotected sex for more than 1 year, quality of erection, satisfaction with sex life;

2) A thorough clinical examination to assess the sexual characters the size and consistency of the testes, the perianal sensation, anal sphincter tone and rectal bulb-cavernous reflex; palpation of the penis to look for any mechanical deformity;

3) Quality of spermatic fluid: production in terms of a seminogram done at 6 months post discharge. All the patients were advised to refrain from any sexual activity (conjugal/self induced 2 days prior to the seminograms. All the seminograms were carried out at our hospital laboratory to rule out any inter laboratory variation in the interpretation of results.

An abstinence period of only 1 or 2 days produce the highest pregnancy rates per intrauterine insemination cycle compared with longer intervals of ejaculatory abstinence[4]. Analyses were for volume, viscosity, sperm concentration, motility, mean progressive motility and morphology according to WHO guidelines on semen analysis[5];

4) Abilty of the spouse to conceive in the next 1 year of follow up with the patients having regular unprotected sex during this time[6].

2.2. Controls

An independent group of 50 males attending the OPD for non uro-genital complaints and matched for age was taken as control. Consent was taken from them to be a part of this study and their approval sought to undergo a seminogram as part of routine check up.All the inclusion criteria except criterion no 2, were kept the same for the controls.

The physical examination of all the subjects in accordance with the protocol described earlier did not reveal any abnormalities and thus did not lead to any disqualifications.

Ejaculates were classified into 2 broad categories based on WHO standard criteria for semen analysis[7].

Group I- Normal ejaculates-sperm concentration>20×10^6, motility>50%, sperm morphology>30%;

Group II- Abnormal ejaculates-sperm concentration<20×10^6, motility<50% sperm morphology<30%.

All data was analyzed by *Chi* square test (Pearson), and when P-value<0.05, it was considered as statistically significant.

3. Results

On history taking during the following OPD visits it was found out that 5 patients had infrequent intercourse on account of male experiencing pain (3 cases) and decreased libido (2 cases). These 5 cases were excluded from the study. Three patients were lost to follow up and were also excluded from further work up. The total number of subjects finally remaining in the study was 60.

From 60 cases of Fournier's gangrene which fulfilled our criteria of inclusion, 10 (16.66%) were in the age group of 21-25 years, 19 (31.66%) were in the age group 26-30 years, 18 (30.00%) were in the age group 31-35 years and 13 (21.66%) were in the age group 36-40 years (Table 1).

Table 1
Age status of two groups [n(%)].

Age (years old)	Group I	Group II	P
21-25	6 (12.00)	10 (16.66)	0.8
26-30	18 (36.00)	19 (31.66)	0.2
31-35	18 (36.00)	18 (30.00)	0.2
36-40	8 (16.00)	13 (21.66)	0.6

Twelve out of the 60 cases (20%) were found to have abnormal seminograms in accordance with the WHO criteria described earlier. Out of these 12 cases, 3 cases were in 20-30 years old and 9 cases in 30-40 years old; 4 cases had pregnancy in 1 year, and 8 were absent. In comparison 2 out of 50 controls (10%) found to have abnormal seminograms. When compared for significance using a *Chi* square test

(Pearson) and finding out the corresponding *P* value, this turned out to be a significant association as the two groups were dissimilar (*Chi*-square value = 6.285, two-tailed *P*-value = 0.012 2).

Out of the 60 couples with a post Fournier's gangrene male as the partner and intending to have a child within a year of discharge from the hospital, 42 couples were able to achieve a successful pregnancy. In the control group, similar couples intending a child with a year from being drafted in the study, 40 were able to achieve a normal pregnancy. When compared for significance using a *Chi* square test (Pearson) and finding out the corresponding *P* value, this turned out to be an insignificant association as the two groups were similar (*Chi*-square value =1.43, two-tailed *P*-value 0.231). The results are summed up in Table 2.

Table 2
Seminograms at 6 months and pregnancies at 1 year in cases and controls [*n*(%)].

Indexes	Group I	Group II
Seminogram at 6 months		
Abormal	2 (4)	12 (20)
Normal	48 (96)	48 (80)
Pregnancy at 1 year		
Pregnant	40 (80)	42 (70)
Non pregnant	10 (20)	18 (30)

4. Discussion

Fournier's gangrene is synergistic necrotising fasciitis of the genital area which leads to thrombosis of small subcutaneous vessels along with infection, resulting in the development of gangrene of the overlying skin and invariably involving the scrotum and adjoining areas. More often than not the patients are left with total loss of the scrotal skin which has been described in literature as "shameful exposure of the testis." Invariably these patients need skin coverage in the form of skin grafts/flaps to cover the exposed testis .As is obvious this leads to loss of normal scrotal tissue along with its musculature (tunica dartos) and its replacement by a less compliant patch of skin.

Scrotum has been considered essential for the maintenance of the ideal environment that is conducive for spermatogenesis, primarily by virtue of aiding in temperature regulation of the testicular environment. Temperature receptors are located in the scrotal skin. When the temperature is too low the tunica dartos muscle contracts causing the scrotal skin to wrinkle and the testis to ascend. Thus the scrotum has a smaller surface area for heat loss and the testes are in the warmer abdominal environment. This principle works in reverse too. Besides this numerous sweat glands in the scrotum secrete sweat and help in the cooling of the testicular environment when the temperature is high.

Testicular function is temperature dependent and requires a temperature 2-C to 4-C below core body temperature[8-10]. In humans, scrotal temperature is highly correlated with testicular temperature[11,12]. The negative effect of exogenous scrotal heat exposure on spermatogenesis has been demonstrated by numerous experimental human and animal studies[13]. Scrotal hyperthermia is a well documented mechanism of abnormal spermatogenesis in common diseases associated with male infertility (*e.g.*, varicocele and undescended testis). Scrotal heat stress has also been linked to occupational exposure to high temperatures and certain lifestyle factors, including use of disposable plastic-lined diapers in children, prolonged car driving, heated car seats, daily activities,

It is generally assumed that the lower temperature leads to reduced rates of oxidative DNA damage and hence to fewer mutations in resulting sperm[14-18]. A second concept relates to the fact that sperm are stored, often over many days or weeks, in the epididymis, particularly the cauda epididymis, which resides at the coolest location within the scrotum[19]. A lower temperature would lead to reduced metabolic rate and oxidative damage in these stored sperm. Linking these concepts is one that suggests that the lower temperature provides a selection process for the best adapted sperm able to confront the metabolic stresses of ejaculation and fertilization[20].

Taking into consideration the aforementioned functions of scrotal skin in regularizing testicular temperature and the consequent fertility it is but obvious to wonder once the post Fournier gangrene patients with substituted normal scrotal skin are at a disadvantage in terms of their fertility. There is a dearth of literature on describing the fertility aspects of post Fournier's gangrene patients. A very few studies have been carried out on this topic and nearly all of them lack a conclusion and are shrouded in ambiguity in terms of clear results.

This study thus was carried out with the intention of analyzing various aspects of fertility in these patients by means of a seminogram post treatment along with the ability of female partners of such men to conceive children post treatment. To our knowledge this is the first high volume study on this topic.

The seminogram was carried out 6 months after discharge from the hospital while the patient was attached to the OPD following all necessary guidelines as previously described. The delay was intentional giving the patient enough time to recuperate from any acute insults he may be facing post treatment and thus may have theoretically altered his spermatogenesis. The patient was assessed for general well being, a positive nitrogen balance as well gross marital satisfaction. The results obtained were compared with the control population .Our study found out that 12 out of the 60 cases (20%) demonstrated an abnormal seminogram as per WHO criteria. The factor most commonly affected was motility followed by total sperm counts and morphology. This is may be an effect of the new rigid scrotal environment formed by non compliant skin grafts or thigh skin flaps. The

substituted skin lacks all the properties necessary for an effective temperature regulation and the decreased testicular environment which aids spermatogenesis. Only 2 out of 50 controls (10%) controls demonstrated abnormal seminograms and when the two test were statistically compared they turned out to be significantly different (*Chi*-square value= 6, two-tailed *P*-value=0.012 2). This result demonstrated the adverse effect the new scrotal environment has on spermatogenesis and thus makes our study the first one to conclusively prove this.

The second aspect of this study was to note the ability of couples with immediate child bearing intentions to conceive. The couples were advised to have unprotected sex till the female became pregnant (latest for 1 year) after which the couple was deemed infertile as per WHO regulations. Another interesting finding was that 8 patients out of the 12 with abnormal seminograms were also the ones who were unable to conceive thus lending some credence to the fact that the neoscrotal environment led altered spermatogenesis may in turn lead to infertility.

But when the pregnancy rates were compared to the control couples and the results were compared for significance, the two groups turned out to be statistically insignificant (*Chi*-square value=1.43, two-tailed *P*-value 0.231) and hence a positive correlation could not be established.

Thus while a post Fournier's gangrene altered testicular environment may be responsible for a change in seminal fluid parameters but these changes may not be severe enough to cause infertility as is amply demonstrated by insignificance of *P* values of pregnancy between the cases and controls.

As our study comprised of males < 40 years of age and the confounding effects of age were removed but it is possible that in older males with an already diminishing spermatogenetic potential, these post Fournier's seminogram alterations may lead to difficulties in couples conceiving.In our study 9 out of 12 patients with abnormal seminograms were of 30-40 years. Table 2. This is particularly relevant for western populations where males prefer to start families at a later age than the developing world countries like India where the average age of fatherhood is much lesser in comparison[21].

Thus the most important result of this study was to demonstrate that while a post Fournier's gangrene patient may develop abnormalities in his spermatogenetic potential but apparently none of these abnormalities is severe enough to impact his fertility and child bearing capability.

Conflict of interest statement

We declare that we have no conflict of interest.

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