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UNILATERAL TESTICULAR TRAUMA: OPTIMAL MANAGEMENT AND POTENTIAL IMPACT ON SEMINAL AND ENDOCRINAL PARAMETERS

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From 1995 to 2000, Fifty three patients were identified to have unilateral testicular trauma according to the records of Emergency Hospital, Mansoura Faculty of Medicine. Of these, 32 patients were contacted for prospective follow up and evaluation. Injuries included blunt trauma in 26 patients and penetrating wounds in 6 patients. Treatment consisted of orchiectomy (9 patients), exploration and repair (12 patients) and conservative measures (11 patients). The study protocol comprised reproductive history, physical examination, routine semen analysis, semen antisperm antibodies estimation and determination of serum FSH, LH and testosterone. Results were compared with a group of semen donors with proved fertility.

In orchiectomy group, mean sperm count was normal but significantly decreased compared to controls. Sperm motility and abnormal forms were not significantly affected. Serum FSH was significantly higher compared to control group but serum testosterone and LH were not significantly altered. In the repair group, all semen and endocrinal parameters did not differ significantly from controls. Seminal antisperm antibodies were elevated in 2 patients with grade 3 injury and unilateral testicular atrophy in another 2 patients with the same grade of injury. In conservative group, sperm count and motility were significantly lower than controls and 3 patients had significantly elevated antisperm antibodies. Hormonal pattern in this group revealed significant elevation of serum FSH with no significant changes in serum LH and testosterone levels. Testicular atrophy was reported in 5 patients 45%) in this group. Pregnancy rate was significantly higher in repair group (83%) compared to orcheictomy (57%) and conservative (50%) groups. In conclusion immediate exploration and repair of unilateral testicular injuries is the most protective to testicular function and fertility especially in grade 1 and 2 injuries. In grade 3 and 4 injuries, orchiectomy is preferred but it is associated with significant decrease in sperm count and pregnancy rate. Conservative treatment is the least protective to testicular function and fertility with the highest incidence of atrophy and abnormal semen parameters and lowest pregnancy rate.

Keywords: unilateral testicular trauma- optimal management- seminal and endocrinal parameters.

INTRODUCTION

Testicular trauma is relatively common in our community especially in rural areas. It can potentially have an impact on endocrinal and seminal parameters that may ultimately affect fertility [1,2]. The degree of impact of testicular trauma on fertility potential will depend on injury itself and method of treatment [3,4]. When unilateral testicular injuries occur, the difficult issue is whether to remove the injured testis or attempt salvage. Animal studies suggested that fertility is impaired after unilateral testicular trauma, possibly related to autoimmune mechanisms which affect the contralateral testis and manifested histologically by decrease in seminefrous tubules diameter with altered spermatogenesis and chronic granulomatous changes [5]. Another animal study suggested that minor testicular trauma can impair testicular blood flow and thereby significantly affect reproductive function [6].

In a trial to evaluate the effect of unilateral testicular trauma and its management on fertility potential, we

assessed parameters related to fertility in patients with history of unilateral testicular trauma who underwent 3 different methods of treatment namely, orchiectomy, repair, and non-surgical (conservative) measures.

PATIENTS AND METHODS

Patients:

we retrospectively reviewed the records of Emergency Hospital, Mansoura Faculty of Medicine. to identify patients who were hospitalized for testicular trauma between January 1995 to December 2000. We identified 53 patients with unilateral testicular injuries, the degrees of which were graded as:- 1- intratesticular haematoma and/or reactive hydrocele, 2- minor laceration of tunica albuginea with surrounding haematocele, 3- multiple laceration of tunica albuginea or major laceration with extrusion of seminefrous tubules and surrounding haematocele, 4- severe trauma of the testis without viable parenchymal tissues requiring orchiectomy[7]. Treatment consisted of unilateral orchiectomy, immediate exploration and repair or conservative (non-surgical) measures. Patients were evaluated by co-operation between General Surgery and Dermatology and andrology Departments of Mansoura Faculty of Medicine, Egypt. The duration between the time of injury and evaluation ranged between 1 and 4 years. Healthy control group consisted of 15 subjects with proven fertility were selected for comparison with patients.

History and physical examination:

Patients were subjected to thorough history with stress on local or systemic diseases which affect fertility. Patients with histories of orchitis, epididymitis, venereal diseases or other medical problems which can affect fertility were excluded from the study. History of pregnancy (> 5 months gestation) was recorded in patients who attempted conception. Complete physical examination including genital and rectal were performed. Cases with varicocele were excluded. Testicular size was measured by orchidometer. Normal testicular size was defined as greater than 20 ml in volume. Atrophy was defined as a testicular volume less than 20 ml [1].

Laboratory evaluation:

All patients and control subjects provided 2 semen samples collected by masturbation at 2 different occasions. The mean result of the 2 samples was calculated for every individual. Semen was analyzed by the conventional method according to the standards of WHO[8]. Serum FSH, LH, testosterone were measured by ELISA using commercially available kits (Roche Diagnostic GmbH, D-68298 Mannheim, Germany). Semen antisperm antibodies were tested using immunobead assay test (Biorad Laboratories, Chemical Division, Richmond, CA, USA). The test was considered clinically significant if more than 50% of the motile sperms were adherent to the beads [8].

Management of patients:

Repair group: incision of tunica vaginalis was done followed by incision of tunica albuginea. After irrigation with isotonic saline, as little as possible of the injured seminefrous tubules were removed (if needed). Tunica albuginea was then closed using cat gut 4/0 with continous sutuers. Tunica vaginalis was left opened with a penrose drain to be removed 48 hours later. In two patients with degloving injury, scrotal skin loss was managed by primary closure in one patient and transportation of the testis to subcutaneous thigh tunnel in the second patient with complete reconstruction after 4 weeks.

Orchiectomy group: orchiectomy was done in cases of shuttered testis, complete transection of the testis or testicular infarction (as evidenced by dark fluid coming from tunica albuginea).

Conservative measures: consisted of scrotal support, non-steroidal anti-inflammatory drugs, ice packs on the scrotum every 4 hours and bed rest for 48 hours. Follow up was done by scrotal ultrasound and Doppler studies.

Statistical Methods:

Results are expressed as mean + S.D.. Student t test was used for comparison between patients and control groups. Results are considered statistically significant at $p \leq 0.05$, moderately significant at $p \leq 0.01$ and highly significant at $p \leq 0.001$. Pregnancy rates were compared using Chi-square test.

RESULTS

Of 53 patients recorded for unilateral testicular trauma, 36 patients were located and agreed to be evaluated. Four patients did not fulfil the inclusion criteria and were excluded, the remaining 32 completed the study. According to the type of treatment received, patients were classified into 3 groups: orchiectomy group (9 patients), repair group (12 patients), and conservative group (11 patients). Twenty sex patients suffered from blunt trauma and 6 patients experienced penetrating wounds. Patients in the conservative group were diagnosed clinically and by recent post-traumatic ultrasound to have haematocele or mild intratesticular haematoma without rupture of tunica albuginea and received conservative treatment only without any exploration. In the other 2 groups, immediate exploration was done and injuries were graded as presented in (Table 1).

Size of untraumatized testes were normal (>20 ml) in all patients of the orchiectomy group. Ten patients in the repair group (83%) had normal size of the repaired testes and 2 patients (17%), both with grade 3 injury, had atrophic repaired testes. In the conservative group, the traumatized testes were atrophic in 5 patients (45%) and normal (> 20 ml) in the remaining 6 patients. The incidence of atrophy in the conservative group (45%) was significantly higher than in repair group (17%). Other clinical data are presented in (Table 1).

Seminal parameters in the orchiectomy group (Table 2) did not differ significantly from control group except for significant decrease in sperm count. However, the count was within the normal range of WHO standards. Similarly, all seminal parameters of the repair group were within normal range with no significant differences compared to controls. In the conservative group, significant decrease in sperm count and active motility was found in comparison with control group. The decrease in sperm count was within the normal range, but percentage of active motility was subnormal. Significant elevation of semen antisperm antibodies was found in 3 patients of conservative group (27%) and in 2 patients of repair group (16%), both had grad 3 injuries.

The hormonal profile of patients and controls is presented in (Table 3). The only significant changes were elevation of serum FSH in orchiectomy and conservative groups compared to controls.

Pregnancy rates were calculated after 2 years of continuous marriage in 17 patients who attempted conception. It was significantly higher in repair group (5 of 6, 83%) compared to orchiectomy (4 of 7, 57%) and conservative groups (2 of 4, 50%).

Table (1): *Clinical data of patients groups:-*

	Orchiectomy	*Repair*	*Conservative*
Number	9	12	11
Age (years)	31.1 ± 9	33 ± 7	29 ± 8
Injury			
Grade 1	-	3	11
Grade 2	2	5	-
Grade 3	2	4	-
Grade 4	5	-	-
Size of traumatized testis:			
Normal		10 (83.4%)	6 (54.5%)
Atrophic		2 (16.6%)	5 (45.5%)

Table (2): *Semen parameters in each group of patients versus control group:-*

	Control (n = 15)	*Orchidectomy (n = 9)*	*Repair (n = 12)*	*Conservative (n = 11)*
Count (Milion/ml)	91 ± 29.2	30.8 ± 9 t = 6.12***	84 ± 12 t = 0.84	38 ± 7 t = 5.37**
Active Motility(%)	65 ± 11.5	57 ± 10.2 t = 1.74	58 ± 9 t = 1.71	37 ± 8 t = 7.1***
Abnormal forms (%)	61 ± 9.1	61.1 ± 10.8 t = 0.02	62.3 ± 8.3 t = 0.39	66 ± 8 t = 1.45

**t significant ($p \leq 0.01$)

***t significant ($p \leq 0.001$)

Table (3): *Hormonal profile in each group of patients versus control group:-*

	Control (n = 15)	*Orchidectomy (n = 9)*	*Repair (n = 12)*	*Conservative (n = 11)*
Testosterone (ng/ml)	6.2 ± 2.4	7.1 ± 1.2 t = 0.7	6.9 ± 2.3 t = 1	6.1 ± 2.4 t = 0.1
LH (mIU/ml)	5.2 ± .3	6.1 ± 2.1 t = 0.96	5.8 ± 1.9 t = 1.2	6.3 ± 2.1 t = 1.25
FSH (mIU/ml)	8.5 ± 1.2	14.4 ± 3.2 t = 6.6*	9.2 ± 1.1 t = 1.5	16.2 ± 3.3 t = 7.06*

*t significant ($p \leq 0.001$)

DISCUSSION

When unilateral testicular injury occurs, the difficult issue is whether to remove the injured testis or attempt salvage. Many concerns arise from the fact that the injury and its management may have a disturbing effect on testicular function that may ultimately affect fertility [1,2,9,10]. Our work was done in a trial to clarify this situation.

In the present study, testicular atrophy was reported only in 2 patients of the repair group (16.6%), both had grade 3 injury, and no atrophy was found among other patients. The cause of atrophy is unknown, but it may be attributed to the subsequent inflammatory condition following the trauma and operation or may be due to partial excision of the extruded seminefrous tubules as it occurred in one patient. Our results agreed with Lin et al., [2] who reported no atrophy after repair of unilaterally traumatized testes with grade 1 and 2 injury. Other authors reported higher incidence of atrophy after repair of unilaterally traumatized testes as Koller et al. (66% atrophy)[10] and Kukadia et al. (56% atrophy)[1]. This high incidence among the last 2 studies may be attributed to the fact that most of their patients had grade 3 injuries with possible partial excision of extruded testicular tissue in some cases. The incidence of atrophy of traumatized tests among conservative group (45%) was significantly higher than in repair group (16.6%). The cause of atrophy may be attributed to post inflammatory fibrosis following intratesticular haematoma, neglected testicular rupture which was misdiagnosed as hematoma by ultrasound or may be due to other yet unidentified mechanisms as vascular or neurological damage [1,6]. Our results agreed with Cass and Luxenberg [9] who reported that initially conservative management lead to the loss of entire testis in 21% of patients in comparison with 6% of those explored promptly after blunt trauma.

Our patients in the repair group had no significant seminal or endocrinal abnormalities except for significant increase of antisperm antibodies in 2 patients with grade 3 injury. These two patients had penetrating testicular injuries and one of them had atrophy of the traumatized testis. These data agreed with Lin et al. [2] who reported no seminal or endocrinal abnormalities in 3 patients after testicular repair except for significant elevation of antisperm antibodies in one of them. Other authors reported abnormal seminal parameters as oligospermia, asthenospermia, and/or teratospermia after repair of unilateral testicular injuries, but no endocrinal or immunological abnormalities were detected [1,10].

The mean sperm count in orchiectomy group was within normal range but significantly lower than controls and repair group. Also, serum FSH was significantly higher than in control or repair groups. No other seminal or endocrinal abnormalities were detected. These data are consistent with Lin et al., [2] who reported significant decrease in sperm densities and significant elevation of serum FSH and LH in orchiectomy group compared to controls. Pathological decrease of sperm counts (oligospermia) and asthenospermia were reported after orchiectomy by Tomomasa et al [11]. The cause of subfertility after orchidectomy remains speculative. A decreased overall testicular mass with subsequent germ cell deficiency and a central hypothalamic-pituitary gonadal axis disturbances may have key roles in the pathogenesis of subfertility [2].

The greatest disturbance of testicular function was found among patients who received non-surgical (conservative) measures after blunt testicular trauma. Significant decrease in sperm count and pathological decrease in active motility were detected in comparison to control group. Significant elevation of antisperm antibodies was found in 3 patients. Abnormal forms also increased but the difference was non-significant compared to controls. Serum FSH significantly increased but LH and testosterone level did not differ from control levels. Nolten et al., [12] reported significant elevation of serum FSH, LH and estradiol after non-surgical treatment of testicular injuries. The cause of abnormal seminal and endocrinal parameters in this group also remains speculative. Traumatized testis may produce abnormal sperms with low motility and increase of abnormal forms. When atrophy occurs, the overall testicular mass will be reduced with consequent decrease in sperm count and elevation of serum FSH.

Presence of significant increase of antisperm antibodies in 3 patients of this group may provide another explanation of abnormal seminal parameters through immunological mechanisms which affect both testes, i.e unilateral trauma causes bilateral pathology. Cass and Luxenberg [9] recommended immediate exploration of all cases of blunt testicular trauma even with normal post-traumatic ultrasound which cannot differentiate intratesticular hematoma from testicular rupture in the majority of cases.

To elucidate the impact of our data on the fertility potential, we calculated the pregnancy rates in 17 patients who attempted conception after injury. Pregnancy rates, after 2 years of continuous marriage, was 83% in the repair group (5 out of 6). The remaining patient had unilateral testicular atrophy after grade 3 injury and considered subfertile according to subnormal seminal parameters and significant elevation of antisperm antibodies. Lower pregnancy rates were reported in the orchiectomy group (57%) and conservative group (50%).

Finally we have concluded that immediate exploration and repair of unilateral testicular injuries is the most protective for testicular function and fertility especially for grade 1 and 2 injuries. As regards orchiectomy, some seminal and endocrinal abnormalities and a lower pregnancy rate compared to repair group were detected. However, it must be done in grade 4 injuries (no viable testicular parenchyma) and may be a better choice for grade 3 injury which may be associated with rupture of blood testis barrier leading to immunological reaction which can affect contralateral normal testis with possibility of atrophy. Non-surgical (conservative) treatment was associated with highest incidence of atrophy, seminal and endocrinal abnormalities and lowest pregnancy rate, so it must be abandoned in all cases of blunt testicular trauma.

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