Progressive Sperm Motility, Sperm Condensation and Spontaneous Pregnancy Rate in Infertile Varicocele Patients at 3-12 Months after Varicocelectomy

M. Jasemi, G. Saki and F. Rahim

1Department of Urology and Kidney Transplantation, Golestan Hospital, Ahwaz Jundishapour University of Medical Sciences, Ahwaz, Iran
2Department of Laboratory of Cell Culture of Anatomical Sciences, Faculty of Medicine, Ahwaz Jundishapour University of Medical Sciences, Ahwaz, Iran
3Apadana Clinical Research Center, Apadana Hospital, Ahwaz, Iran
4Physiology Research Center, Ahwaz Jundishapour University of Medical Sciences, Ahwaz, Iran

Abstract: To evaluate the effect of varicocele repair on sperm motility, sperm condensation and pregnancy rate in varicocele patients who referred to Department of Urology of Golestan and Apadana hospitals. The records were retrospectively evaluated for infertile patients with palpable varicocele who underwent varicocelectomy at Department of Urology of Golestan and Apadana Hospitals, Ahwaz, Iran from December 1990 to September 2008. The semen analysis of patient at pre-operatives and 3, 6 and 12 months post-operative and also pregnancy rate was calculated at 3, 6 and 12 months of follow-up. Before operation, no significant differences were seen among patients with right and left varicocele in sperm motility and condensation (p>0.05). Significant differences were seen in sperm motility and condensation of patients with bilateral varicocele compared to another patients (p<0.05). After surgery in three groups of patients with varicocele, the sperm motility and condensation significantly increased (p<0.05). Percentage of spontaneous pregnancy in 1 year after varicocele treatment is 31 to 40% of cases. The results of present study have shown that repair of varicocele by surgery significantly improved sperm motility, condensation and also 31-40% of infertile patients achieved pregnancy spontaneously.

Key words: Varicocelectomy, fertilization, sperm analysis, repair, Apadana hospital

INTRODUCTION

Varicocele is a dilation of internal spermatic veins that drain the testicle (Kadyrov et al., 2007). It is very common condition present in 15% of the general male population and 40% of men evaluated for infertility (Naughton et al., 2001). A varicocele develops because of defective valves that normally allow for blood to flow away from the testicle toward the abdomen (Ahlberg et al., 1996). Testicular injury occurs due to abnormal back flow of blood from the abdomen into the scrotum and this create a hostile environment for sperm development (Sepa et al., 1981). A unilateral varicocele may affect both testicles (Jarow, 2001). The most probable explanation for the more frequent development of a varicocele on the left side alone is because the left spermatic vein is longer than the right (Gray, 2005). The left vein enter the left renal vein at a right angle near a site of compression by the mesenteric artery while the right spermatic vein drains at a softer angle into the vena cava. These anatomical factors promote back flow of blood in the left spermatic vein, resulting in pooling of blood and increased temperature and congestion in the testicle (Tam, 2004; Sigman and Jarow, 1997). The diagnosis of varicocele can usually be made on physical examination of the scrotum while the patient is standing. The varicocele feels like a bag of worms and disappears or becomes significantly reduced when the patient lies down (Hargrave et al., 1991). Repair of the varicocele is indicated when the couple has documented infertility with normal or potentially normal female partner but a male with one or more abnormal semen parameters and the presence of varicocele on physical exam and also when a varicocele causes testicular pain or discomfort or there is a significant discrepancy between the sizes of two testicles (Ishikawa and Fujisawa, 2005). The important sperm functions are impaired in patients with varicocele (El-Segini et al., 2002).

Corresponding Author: Ghasem Saki, Department of Anatomy and Embryology, Faculty of Medical, Ahwaz Jundishapour University of Medical Sciences, Ahwaz, Iran
Tel: 0098-9166181685 Fax 0611-3367562

2640
The improvement of seminal parameters after varicocelectomy has been reported by several investigators in clinical series (Libman et al., 2006; Pasqualotto et al., 2005; Gat et al., 2005; Grober et al., 2004). Furthermore some researches suggest that varicocelectomy can improve human sperm DNA integrity in infertile men with varicocele (Niederberger, 2005; Zini et al., 2005). Non randomized comparative studies (Reichart et al., 2000; Perimenis et al., 2001; Onozawa et al., 2002) and randomized clinical trials (Madgar et al., 1995; Nieschlag et al., 1998). More controversies exist concerning the role of varicocelectomy to obtain pregnancy in infertile couples (Evers et al., 2004; Ficarra et al., 2006). The aim of this study was to evaluate the effect of varicocelectomy on sperm motility, sperm condensation and pregnancy rate.

MATERIALS AND METHODS

This retrospective cross-sectional study included infertile patients with palpable varicocele who underwent varicocelectomy at Department of Urology of Golestan and Apadana Hospitals, Ahwaz, Iran from December 1990 to September 2008. This study was reviewed and approved by the Institutional Ethics Committee of Ahwaz Jondishapur University of Medical Sciences. All patients provided informed consent. The Mean±SD patients age was 30.4±6.9 years (range 16-40 years). Pre-operative evaluations included a complete history, physical examination and semen analysis. The presence of varicocele was diagnosed on the basis of venous diameter of greater than 3 mm, with increasing diameter during Valsalva maneuvers or when changing from supine to upright with scrotal gray-scale ultrasonography (McClure et al., 1991). Increased venous retrograde flow in the pampiniform plexus in the upright position, or during the Valsalva maneuver was used as a supporting sign of the presence of varicocele (Petros et al., 1991). The varicocele diagnosis was assigned according to World Health Organization (World Health Organization, 1993). Varicocele was graded as:

- **Grade I**: A distinct dilation of the internal spermatic veins palpable during a Valsalva maneuver when upright
- **Grade II**: A palpable vein when upright with no Valsalva maneuver or
- **Grade III**: A vein both palpable and visible through the scrotal skin when upright with no Valsalva maneuver

We excluded patient who were <16 or >40 years old, single patients, patients with sub-clinical and grade one varicocele, patients with normal semen analysis and patients with further pathologies that were associated to varicocele and potentially were responsible for an alteration of semen analysis. In all patients, pre-operative semen analysis were performed using two different semen specimens (the higher value was adopted), each obtained by masturbation and at least 3 weeks pre-operatively and 3.6 and 12 months after varicocelectomy treatment according to the World Health Organization recommendation (1992a). Specifically, the abstinence period was 2-3 days in all cases. Preoperative evaluation included the execution of two semen analysis. The interval between the two sample collections had to be >7 days or <3 weeks. The spontaneous pregnancy rate was calculated at 3, 6 and 12 months after varicocelectomy.

**Statistical analysis**: The Chi-square and ANOVA were used as appreciated for comparisons sperm motility and sperm count before and after treatment of varicocele. The p-value less that 0.05 considered as significant difference. All computations were performed using the Statistical Package for the Social Sciences (SPSS-PC1 for Windows; SPSS, Chicago, IL).

**RESULTS**

During this study the records of 1290 infertile men with varicocele who referred to Urology Department of Golestan and Apadana hospitals in Ahwaz, Iran were evaluated. The median age of patients was 30.4±6.9 years (range 16-40 years). The varicocele was located on the right side in 144 (11.16%) cases, on the left side in 1083 (83.95%) and bilaterally in 63 (4.88%). The median value of the percentage of progressive motile sperm was 30.12, 28.83 and 19.53 in patient with varicocele located in right, left and bilateral side respectively (Table 1). Statistical analysis show that the progress sperm motility difference in patient with unilateral varicocele was not significant (p>0.05) but difference between patient with bilaterally varicocele and patients with unilateral varicocele was significant (p<0.05). Median sperm condensation as 16.15, 13.63 and 9.52 in patient with varicocele located in right, left and bilateral side, respectively. Statistical analysis show that sperm condensation in patient with bilateral

<table>
<thead>
<tr>
<th>Varicocele side</th>
<th>No. of patients</th>
<th>Progressive motile sperm (%)</th>
<th>Sperm condensation (10^6 mL^-1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right</td>
<td>144 (11.16%)</td>
<td>30.12±4.65</td>
<td>16.15±3.25</td>
</tr>
<tr>
<td>Left</td>
<td>1083 (83.95%)</td>
<td>28.83±3.12</td>
<td>13.63±3.25</td>
</tr>
<tr>
<td>Bilateral</td>
<td>63 (4.88%)</td>
<td>19.53±1.01</td>
<td>9.52±2.12</td>
</tr>
<tr>
<td>Total</td>
<td>1290</td>
<td>27.49±4.32</td>
<td>13.07±2.20</td>
</tr>
</tbody>
</table>

Data are expressed as Mean±SD
Table 2: Sperm motility after 3-12 months after varicocelectomy

<table>
<thead>
<tr>
<th>Varicocele side</th>
<th>No. of patients</th>
<th>Months</th>
<th>3</th>
<th>6</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right</td>
<td>105 (9.09%)</td>
<td>45.1±1.29</td>
<td>56.1±1.01</td>
<td>55.1±1.09</td>
<td></td>
</tr>
<tr>
<td>Left</td>
<td>990 (86.40%)</td>
<td>40.1±3.12</td>
<td>47.1±4.09</td>
<td>51.3±0.09</td>
<td></td>
</tr>
<tr>
<td>Bilateral</td>
<td>52 (4.50%)</td>
<td>25.0±1.66</td>
<td>29.0±1.36</td>
<td>47.1±2.08</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1155</td>
<td>36.7±2.25</td>
<td>44.1±1.15</td>
<td>51.2±1.28</td>
<td></td>
</tr>
</tbody>
</table>

Data are expressed as Mean±SD.

Table 3: Sperm concentration 3-12 months after varicocelectomy

<table>
<thead>
<tr>
<th>Varicocele side</th>
<th>No. of patients</th>
<th>Months (10^6/mL)</th>
<th>3</th>
<th>6</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right</td>
<td>105 (9.09%)</td>
<td>20.7±3.25</td>
<td>28.0±1.99</td>
<td>40.1±1.96</td>
<td></td>
</tr>
<tr>
<td>Left</td>
<td>990 (86.40%)</td>
<td>15.3±3.17</td>
<td>25.9±3.12</td>
<td>30.6±3.69</td>
<td></td>
</tr>
<tr>
<td>Bilateral</td>
<td>52 (4.50%)</td>
<td>12.1±2.08</td>
<td>13.4±0.81</td>
<td>16.1±3.59</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1155</td>
<td>22.7±2.83</td>
<td>22.48±1.97</td>
<td>28.96±2.54</td>
<td></td>
</tr>
</tbody>
</table>

Data are expressed as Mean±SD.

varicocele significantly low in compare with another patients (p<0.05). The sperm concentration in two groups of patients with varicocele in left and right was not difference (p>0.05).

As shown in Table 2 and 3, 39,105 and 11 patients were excluded from patients with right, left and bilateral varicocele group, respectively. The remaining 105 (9.09%) patients with right side varicocele, 990 (86.40%) patient with left side varicocele and 52 (4.50%) patients with bilateral varicocele met the study inclusion criteria.

The median value of the percentage of progressive motile sperm in patients with right side varicocele was 45.11, 56.16 and 55.35, respectively in 3, 6 and 12 months after varicocelectomy. This data shows that after varicocelectomy the percentage of progressive motile sperm improved after repair of varicocele. Significant differences were seen in 6 and 12 months compared to 3 months after varicocelectomy (p<0.05). The difference between 6 and 12 months after surgery was not significant (p>0.05). Sperm concentration in patients with right side of varicocele at 3, 6 and 12 months after surgery was 20.75, 28.03 and 40.13 million mL^-1, respectively and improved sperm concentration was seen after surgery. The sperm concentration at 12 months after repair of varicocele was significantly high (p<0.05). The median value of the percentage of progressive motile sperm and sperm concentration in patients with left side varicocele significantly improved after varicocelectomy and at 12 months after varicocelectomy were significantly high (p<0.05) as same as in patient with bilateral varicocele highest sperm motility and concentration achieved at 12 months after surgery.

In this study, 105 and 17 patients were excluded from patients with right, left and bilateral varicocele group, respectively. The remaining 88 (9.60%) patients with right side varicocele, 793 (86.57%) patient with left side varicocele and 17 (3.82%) patients with bilateral varicocele met the study inclusion criteria. The fertilization rate in patient with varicocele at 3-12 months after repair of surgery was 40.90, 40.85 and 31.42%, respectively (Table 4). The difference between different type of varicocele was not significant (p>0.05).

**DISCUSSION**

Varicocele affects fertility and is the most common known cause of infertility (Konodo et al., 2009). Various mechanisms have been suggested to account for the testicular dysfunction associated with varicoceles, including retrograde flow of toxic metabolites from the adrenal gland or kidney, venous stasis with germinal epithelial hypoxia, alteration in the hypothalamic-pituitary-gonadal axis and increases in testicular temperature (Takahara et al., 1991). In addition, deregulations of nitric oxide (Miroopoulos et al., 1996), reactive oxygen species (Sharma and Agarwal, 1996) and regulators of apoptosis (Fazlioglu et al., 2008) have been implicated in the pathophysiology of varicoceles. The results of the present study demonstrate that the repair of varicocele by surgery cause highly significant improvement of progressive motility in sperm and as same as concentration. Nasr-Esfahani et al. (2007) in a study show that all the three semen parameters and percentage of sperms with normal protamine content have improved post-surgery so that they suggested that patients with low initial sperm count may benefit more from assisted reproductive techniques or varicocelectomy followed by assisted reproduction. The vast majority of physicians who manage male infertility patients believed that varicoceles are a major cause of male infertility and that repair of varicocele will improve fertility (World Health Organization, 1992b). Some controversial researches are whether or not varicoceles should be repaired prophylactically to prevent future infertility and whether varicocele size has prognostic significance. Interestingly, the results of this research show that the choice of varicocele to improve the fertility and pregnancy may be better. The latter issue has a major impact upon deciding whether or not sub-clinical (non-palpable) varicoceles should be diagnosed and
repaired. However, there are many clinicians who are not convinced that varicocele repair improves male fertility (Kamischke and Nieschlag, 1999). Evers et al. (2009) claimed that no evidence that treatment of varicoceles in men from couples with otherwise unexplained subfertility improves the couple's chance of conception, interestingly the data of this study show that in patients with varicocele 1 year after varicocele treatment, the percentage of spontaneous pregnancies accounts for 31-40% of cases. This data is similar to earlier study by Schlegel (1997). This study has documented reduced sperm motility and condensation in men with bilateral varicoceles as compared with unilateral varicocele men.

In conclusion based upon the current data available several conclusions maybe reached. First, there is very strong evidence to support the fact that, as observed for centuries, varicoceles exert a deleterious effect upon the sperm motility and condensation. This effect appears to be bilateral, even in men with unilateral Varicoceles. Second, repair of varicocele improved the sperm motility and condensation. Third, 31-40% of infertile patients one year after varicocele treatment achieved pregnancy. Finally, the varicocele surgery may be the correct choice to enhance the chance of the fertility and pregnancy.

REFERENCES


