

## SPERM QUALITY IN SPONTANEOUS UNILATERAL ABDOMINAL CRYPTORCHID BOARS

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Cryptorchidism is the most frequent male sexual disorder in mammals, especially in boars, stallions and humans. Unilateral or bilateral cryptorchidism arises as a consequence of different anomalies affecting the process of descent of one or both testes towards the scrotal cavity, respectively. Testicular descent can be null or else partial; in the first case, the testes remain in an abdominal position (abdominal cryptorchidism), whereas in the second case the testes can be found at different levels in the inguinal canal (inguinal cryptorchidism). In any case, cryptorchidism provokes an alteration of the seminal quality, resulting in a more or less remarkable lost of fertilizing ability. The aim of the present study was to determine the effects of spontaneous unilateral abdominal cryptorchidism on the sperm quality from postpubertal boars.

This study was performed using three healthy boars and three unilateral cryptorchid boars with the right testis in an abdominal position. From the age of 6.5 months, boars were subjected to a semen collection rhythm of once per week. Semen was collected from the healthy boars by mounting of the males on a dummy and the gloved hand method. Due to their poor libido, semen from the unilateral abdominal cryptorchid boars was obtained by mounting of the males on a female and the gloved hand method. In the healthy boars, the sperm quality of the first semen collection differs from the following ejaculates, so in most cases the sperm parameters stabilize as of the third semen collection (Martín, 1990). Despite the results obtained from the sperm analysis of the first semen collection are exposed, the interest of this paper is the comparative study of the sperm quality of the seventh semen collection between the unilateral abdominal cryptorchid boars and the healthy boars.

Sperm concentration was determined after a total count of three samples of spermatozoa using the Makler counting chamber (Ludwig and Frick, 1990). Sperm motility was evaluated by phase-contrast microscopy, and sperm vitality was assessed by fluorescent microscopy following the acridine orange method (Barth and Oko, 1989); to determine the frequency of motile and immotile spermatozoa, and of live and dead spermatozoa, respectively, two counts of 100 spermatozoa were evaluated using samples from the three healthy boars and the three unilateral abdominal cryptorchid boars. Sperm morphology was assessed from the observation under light microscopy of smears stained with a Quick Panoptic Method (Bonet et al., 1995). To determine the frequencies of mature spermatozoa, immature spermatozoa and aberrant spermatozoa, five counts of 100 spermatozoa were evaluated using samples from the three healthy boars and the three unilateral abdominal cryptorchid boars. The statistical analysis of data was made using analysis of variance (ANOVA); *P* values < 0.01 were considered significant. Results are expressed as the mean  $\pm$  SD. Mean values were calculated using data from the three healthy boars and the three unilateral abdominal cryptorchid boars.

Sperm Parameter	Healthy boars	Unilateral abdominal cryptorchid boars	Probability
1. Sperm concentration (Spz x 10 <sup>6</sup> /ml) (n=6)			
Collection 1	147.2 $\pm$ 9.50	378.9 $\pm$ 51.2	0.0001*
Collection 7	634.4 $\pm$ 78.3	130.0 $\pm$ 23.5	0.0001*
2. Sperm vitality (%) (n=6)			
Collection 1	85.2 $\pm$ 2.7	87.0 $\pm$ 3.7	0.3542
Collection 7	93.7 $\pm$ 2.7	89.3 $\pm$ 2.7	0.0193
3. Sperm motility (%) (n=6)			
Collection 1	88.0 $\pm$ 3.0	92.0 $\pm$ 6.6	0.2073
Collection 7	97.2 $\pm$ 1.2	66.3 $\pm$ 8.1	0.0001*
4. Sperm morphology (%) (n=15)			
Collection 1			
Mature spermatozoa	85.7 $\pm$ 4.1	93.7 $\pm$ 1.6	0.0001*
Immature spermatozoa	1.0 $\pm$ 0.8	0.3 $\pm$ 0.6	0.0200
Aberrant spermatozoa	13.3 $\pm$ 3.6	5.9 $\pm$ 1.4	0.0001*
Collection 7			
Mature spermatozoa	92.7 $\pm$ 1.5	93.2 $\pm$ 1.4	0.3259
Immature spermatozoa	0.8 $\pm$ 1.3	0.2 $\pm$ 0.4	0.0918
Aberrant spermatozoa	6.5 $\pm$ 2.0	6.6 $\pm$ 1.5	0.9184

Table 1. Sperm quality of the healthy boars and the unilateral abdominal cryptorchid boars. Data are expressed as mean  $\pm$  SD. Collection 1: 6.5 months; Collection 7: 8 months. \* Statistically different values (*P*<0.01).

In the healthy boars, the sperm concentration is significantly higher in the seventh semen collection than in the first semen collection (*P*=0.0001). Contrarily, the sperm concentration in the seventh semen collection from the unilateral abdominal cryptorchid boars was significantly lower than in the first semen collection (*P*=0.0001). Sperm concentration in the seventh semen collection from unilateral abdominal cryptorchid boars was statistically lower than in the healthy boars (*P*=0.0001).

There were not significant differences in the sperm vitality between the first and the seventh semen collections from the healthy boars ( $P=0.0281$ ) and from the unilateral abdominal cryptorchid boars ( $P=0.2414$ ). Sperm vitality in the seventh semen collection did not differ significantly between the unilateral abdominal cryptorchid boars and the healthy boars ( $P=0.0193$ ). In the healthy boars, the sperm motility is significantly higher in the seventh semen collection than in the first semen collection ( $P=0.0001$ ). The sperm motility in the seventh semen collection from the unilateral abdominal cryptorchid boars was significantly lower than in the first semen collection ( $P=0.0001$ ); moreover, the motile spermatozoa showed a non-progressive motility in the first and the seventh semen collection. Sperm motility in the seventh semen collection from the unilateral abdominal cryptorchid boars was significantly lower than in the healthy boars ( $P=0.0001$ ). In the healthy boars, the frequency of mature spermatozoa was significantly higher in the seventh semen collection than in the first semen collection ( $P=0.0001$ ), whereas the frequency of aberrant spermatozoa was significantly lower in the seventh semen collection ( $P=0.0001$ ); there were not differences in the frequency of immature spermatozoa between the first and the seventh semen collections from the healthy boars ( $P=0.6176$ ). In the unilateral abdominal cryptorchid boars, there were not differences between the first and the seventh semen collection in the frequency of mature spermatozoa ( $P=0.3472$ ), immature spermatozoa ( $P=0.4929$ ) and aberrant spermatozoa ( $P=0.2094$ ). In the seventh semen collection, no differences were found between the unilateral abdominal cryptorchid boars and the healthy boars in the frequency of mature spermatozoa ( $P=0.3259$ ), immature spermatozoa ( $P=0.0918$ ) and aberrant spermatozoa ( $P=0.9184$ ).

The first semen collection from the unilateral abdominal cryptorchid boars showed normal sperm concentration, vitality and morphology; despite the sperm motility was normal, the quality of the movement was low. A significant decrease of the sperm concentration and motility was found in the seventh semen collection, whereas the sperm vitality and the sperm morphology maintained in normal values. The decrease of the sperm concentration in the seventh semen collection from the unilateral abdominal cryptorchid boars is attributed to a progressive decrease of the testicular sperm production (Pinart et al, 1995), which is related to a decrease of the spermatogonial population in the ectopic testes (Lee, 1993). The high sperm concentration observed in the first ejaculate was related to the sperm accumulation in the epididymal cauda before the first semen collection. When submitting the boars to a semen collection rhythm of once per week, the sperm amount accumulated in the epididymis was lesser, due to the testicular sperm production was low, and the sperm concentration of the following semen collections decreased. Despite the decrease of the testicular sperm production, the low frequency of aberrant sperm forms indicate that the cellular differentiation takes place correctly in case of spontaneous unilateral abdominal cryptorchidism. In the cryptorchid males, the ectopic position of the testis manifests itself associate to the ectopia of the epididymis, the organ in which spermatozoa acquire the movement capacity. The presence of spermatozoa with non-progressive motility in the ejaculates from the unilateral abdominal cryptorchid boars can be due to the ectopic position and the dysfunction of the epididymides associated to the abdominal testes (Haidl et al, 1993). Cryptorchid epididymides keep a temperature similar to the body temperature and present a reduction of diameter and length, specially of the epididymal cauda, which provokes an increase of the transit velocity of spermatozoa through the epididymal duct (Foldes and Bedford, 1982); this increase of the transit velocity of spermatozoa gives rise to abnormalities in the formation of disulphide bonds of the midpiece (Mundy et al., 1995), which could be responsible for the low quality of the sperm movement in the first and seventh semen collection from the unilateral abdominal cryptorchid boars. The decrease in sperm concentration and motility not only results from the low production rate of the abdominal testes and the associated epididymal dysfunction, but probably is also related with the deleterious effect generated by the ectopic position of the cryptorchid testes on the scrotal testes and epididymides (Pinart et al, 1995). Even though the progressive degeneration is much more significant in the ectopic testes than in the scrotal testes, it has been reported that unilateral cryptorchidism affects more severely the scrotal testis in the cases in which right testis has an ectopic position (Mieusset et al, 1995).

Thus, the present study showed that spontaneous unilateral abdominal cryptorchidism affects, mainly, the sperm concentration and motility (whereas the sperm vitality and the sperm morphology maintained in normal values). These alterations were attributed, respectively, to the dysfunction of the ectopic testes (low sperm production) and epididymides (abnormalities in the sperm maturation) as well as to their deleterious effect on the scrotal testes and epididymides.

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