
Abstract

Birefringence in sperm heads reflects an organized and very compacted texture, indicating nuclear and acrosomal structural normality. This study performed a direct analysis of the acrosome integrity in single spermatozoa to verify whether a pattern of total or partial head birefringence reflected the acrosome status. The morphology in fresh samples was assessed according to World Health Organization criteria while the characteristics of birefringence were evaluated by polarized light. Acrosome integrity was evaluated by fluorescein isothiocyanate Pisum sativum agglutinin that binds selectively to the acrosome content. According to the results, a reacted acrosome was present in 96% of spermatozoa with partial birefringence and only in 35% of those with totally birefringent heads. A great proportion of sperm cells with normal morphology showed total birefringence both in the presence (59%) or in the absence of motility (45%; P < 0.01), while in morphologically abnormal spermatozoa the frequency of total birefringence was comparable to that of partial birefringence irrespective of motility (26% and 27%, respectively, in motile spermatozoa; 22% and 19%, respectively, in immotile spermatozoa). These data support a strong association between partial birefringence and reacted acrosome and show that the patterns of birefringence vary depending on sperm motility and morphology.

Human sperm cells are naturally birefringent when observed in a polarizing light due to the presence of longitudinally oriented protein filaments. The detection of birefringence in sperm heads reflects an organized and very compacted texture that indicates nuclear and acrosomal structural normality. Basically, three types of head birefringence have been observed: total, partial (localized in the post acrosomal region) and abnormal (absent or irregular). Data from electron microscopy has suggested a correlation between acrosome integrity and birefringence patterns. The aim of this study was to verify this hypothesis by direct analysis of the acrosome status in single spermatozoa. The morphology in fresh samples was assessed according to World Health Organization criteria while the characteristics of birefringence were evaluated by polarized light. Acrosome integrity was evaluated by fluorescein isothiocyanate Pisum sativum agglutinin that binds selectively to the acrosome content. According to the results, 96% of spermatozoa with partial birefringence had a reacted acrosome, while 65% of totally birefringent heads had an intact acrosome. A large proportion of sperm cells with normal morphology showed total birefringence both in the presence (59%) or in the absence of motility (45%; P < 0.01), while in morphologically abnormal spermatozoa the frequency of total birefringence was comparable to that of partial birefringence irrespective of motility (26% and 27%, respectively, in motile spermatozoa; 22% and 19%, respectively, in immotile spermatozoa). These data support a strong association between partial birefringence and reacted acrosome and show that the patterns of birefringence vary depending on sperm motility and morphology.