Meiotic and Synaptonemal Complex Studies in 45 Subfertile Males


Summary. We describe the results of meiotic and synaptonemal complex (SC) studies in a selected series of 45 subfertile males with different meiotic and seminal alterations. SC anomalies (pairing anomalies, fragmented SCs, or presynaptic arrest) were observed in 32 cases (71.1%). In 31% of the abnormal cases, meiotic anomalies could only be detected through the study of SCs. The origin of synaptic anomalies may be related to the assembly of myosin molecules along the chromosomes. SC analysis should become routine in the study of subfertile males.

Introduction

In 1966, Mc Ilree et al. described for the first time the presence of meiotic abnormalities in subfertile males. Since then two basic types of chromosome alteration have been described: those resulting from structural or numerical changes, that can also be detected in somatic cells, and anomalies limited to the germ-cell line due to meiotic mutations that affect the synaptic process (asynapsis or desynapsis) (Hultén et al. 1970, 1974; Pearson et al. 1970; Chandley et al. 1975; Ferguson-Smith 1976; Chandley 1979; Templado et al. 1976, 1978, 1980), and that may affect all bivalents or only some of them (Templado et al. 1981). The incidence of meiotic mutations in our series of 1084 meiotic studies in subfertile males (by December 6, 1981) stands around 2.5%. In 1974, Hultén et al. suggested that the cause of the meiotic abnormalities observed in oligoachiasmatic men could be a defective formation of the synaptonemal complex. In this paper we describe the results of meiotic and synaptonemal complex studies in a series of 45 subfertile males.

Materials and Methods

The sample included 45 subfertile males attending the infertility clinic of the Fundación Puigvert or the Centro de Estudios Andrológicos, with severe anomalies in one or more of the three main criteria of semen quality: number, morphology, and motility. In 44 cases, the karyotype was normal, 46,XY. One of the patients had a 14/21 translocation (Vidal et al. 1982).

Testicular biopsies were removed under local anesthesia. Specimens were divided into two parts; one was placed in 0.038M KCl for meiotic chromosome studies, using the technique of Evans et al. (1964); the remainder was placed in F-10 medium with 20% fetal calf serum and processed for synaptonemal complex studies following a method previously described (Vidal et al. 1982). Selection of the patients for SC studies was based on the results of classical meiotic studies. The different groups analyzed included:

1) Patients with a complete meiotic arrest at the primary spermatocyte level (9).
2) Patients with a complete meiotic arrest at the primary spermatocyte level and pairing anomalies in prophase I (4).
3) Patients with some normal metaphase I figures but with an almost complete meiotic arrest at the primary spermatocyte level (severe oligozoospermia or azoospermia) (5).
4) Patients with a normal meiotic process and an intermediate degree of meiotic arrest (oligozoospermia) (13).
5) Patients with partial desynapsis (Templado et al. 1980) (3).
6) Patients with desynapsis of individual bivalents (Templado et al. 1981) (3).
7) Patients with structural anomalies (1).
8) Patients with small univalents in metaphase I, previously considered as “normal” (3).
9) Patients with only Sertoli cells in their meiotic preparations (4).

Fig. 1. Pachytene nucleus from a patient from Group I. Pairing of SCs is complete. Some kinetochores are indicated by arrows. Arrowhead: axes of the XY bivalent
The maternal age was between 20–25 years in seven cases, between 26–30 years in eighteen cases, between 31–35 years in nine cases, between 36–40 years in five cases, 41 years in two cases, and in four cases the maternal age was not on record. In three cases the father and mother were first cousins and in the other 42 cases the parents were not consanguineous. Twenty-four patients had brothers and/or sisters with progeny. Fifteen patients had brothers and/or sisters without progeny but with no known fertility problems. Four patients had no brothers or sisters and in two cases these data were not on record.

Results

The results obtained from the SC study have been arranged into four groups.